The Ant People

Hanns Heinz Ewers

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A Town Meeting of the Ants.

THE ANT PEOPLE

By

DR. HANNS HEINZ EWERS

Translated by

CLIFTON HARBY LEVY

WITH ILLUSTRATIONS

The Ants are a People not strong,
Yet they provide their food in the summer.
Proverbs, xxx:25

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INTRODUCTION

The Ants are a wonderful people. They have some of the virtues and many of the vices of humanity. They are almost human in error, and efficient to a fault. Yet most of us have known very little about Ants, the commonest of insects, probably because the scientific writers do not care to write so that any ordinary human being can understand them. The literature dealing with Ants fills many shelves in our libraries, but grows dusty from lack of use, as we laymen find so little that is not technical, written in the scientific jargon which forbids enjoyment.

Why may we not delight in gaining information about the insects that swarm by the billions in every part of the earth, and play a considerable part in the animal and vegetable life of the world?

It remained for Dr. Hanns Heinz Ewers to give us a readable book telling the complete story of the Ant People with all its variations and interesting features. It is enlightening and interesting, because it is thoroughly alive.

It is very strange that Maeterlinck wrote the epic of the Bee, and Fabre gave us a comprehensive view of the Wasps and other insects, in the French, and we had to wait for a German to give us the tale of the Ant. And yet the English speaking world has manifested intense interest in popular science.

The ultra scientific investigator is so intent usually upon his task of ascertaining the facts that he lacks both the patience and the skill to present the results of his work in readable form. Yet he despises the popularizer who alone can interest the general public in his work. As a result the scientists fail to recognize the splendidly original work of a man like Fabre, as they sneered at the vivid presentation of natural history at the hand of Brehm.

Dr. Ewers was especially well prepared for his work, through his long experience in the literary field, for he has written novels, books of travel, and plays, thus bringing to the task of presenting the story of the Ant People talents widely recognized as being of a high order.

Having traveled in all parts of the Globe it may be truly said, in his own inimitable style, that "He has poked his nose into Ant nests in every land." He has fought the Fire Ants of Texas, studied the common Red Ants of Georgia, faced the Wandering Ants in Mexico, and been bitten by the Bull Dog Ants of Australia. The information which he gives us is at first hand, and because of his literary equipment he makes the story interesting from beginning to end. The man, woman or child who wants to know all about Ants can hardly fail to be satisfied with the presentation of the subject at the hands of Dr. Ewers, for he helps us to see these insects from every angle, and gives us as complete a story of the varied life of these most interesting creatures as was possible within the compass of a single volume.

The original had no illustrations, but it seemed to the translator that the value of the book would be increased greatly by inserting pictures of Ant Life from the best authorities.

Many of our preconceived ideas about Ants are exploded by Dr. Ewers. We find that the Ants are not all as industrious as we have been taught to believe. We learn that among the Ants are many species that never work, others that live by theft, and still others who live like the robber barons of the Middle Ages. In a word, we may now learn all that the layman needs to know about Ants, and how they live, love, work, or loaf, just like some other Peoples.

It is a tale filled with the human interest that we seek, yet the author has been faithful to facts, and has not hesitated to refute many of the errors of the ultra-scientists.

It is hoped that the readers will enjoy perusing this volume as much as the translator did.

CLIFTON HARBY LEVY.

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CHAPTER I

THE WEDDING OF THE ANTS

When human beings marry, they select a day that is said to be lucky. In olden times they consulted the stars and some superstitious souls do the same to-day. The Ants also select a lucky day and a lucky hour for their wedding, but they are cleverer than we; whereas we move in the dark, they know with certainty. How they reach their decision, we do not know; they seem to have some special sense of wind and weather and to guide themselves accordingly.

That the Ant People are preparing for their wedding may be observed in the nest, for days before. The usual work of the regular life-circle is interrupted; all of the Ants are possessed by a visible restlessness. Not only are the winged males and females rushing about the nest in a high state of excitement, and climbing over grass and stones, but even the workers forget their labors. They appear to be bidding farewell to those about to wed; they pat them with their feelers, and fuss around, feeding them from their crops.

This is the Holy Spring, the *Ver Sacrum,* of the ants! Men too knew this sacred custom once upon a time, several thousand years ago in the

Italian cities—the Sabines, Latins, Samnites—before the founding of Rome. If the city had become too crowded through over-population, the young folks, youths and maidens, had to leave. They were sanctified to the gods, crowned with wreaths, laden with gifts, and bade good-by. These young people betook themselves to the mountains, celebrated their bridals, and founded a daughter-city and a new people—or sometimes they perished.

It happens often that there are more males than females, or vice versa, in the hymeneal flight of the Ants, the reason for this, doubtless, being the avoidance of inbreeding, for on the wedding-day, and only on this occasion, the strong national state-feeling of the Ants yields to commerce with citizens of some other state. It should not be understood that the female Ants yield themselves to the males of another species; they give themselves only to others of the same or an allied species, though possibly from another community. To put it in human terms: the Swede accepts a Norwegian, Englishman, German, or Dutchman as spouse but not a negro or Papuan; the Chinese will select a Japanese or Korean, but not an Arab.

The impatient winged Ants are sometimes restrained by the workers by main force until the happy hour arrives; and then, all that have wings rise into the air. One pursues the other, usually the males in the lead. Not every one, however, flies away freely; a few of the females are held firmly by the workers—we might almost call it imprisoned. These are the maiden Ants, which could not wait for the wedding-day and have lost their virginity. They must stay in the nest and work for the reproduction of their people. They have committed incest with their brothers or half-brothers, and for this reason are barred from the beautiful wedding-flight. Otherwise their lot is better than that of their more virtuous sisters. They are spared all the dangers of the real brides; all the endless labor of the young mothers to rear their own progeny. Some unfructified females also are compelled to stay in the nest; possibly they preserve the state-wisdom of the Ant People as substitute mothers for the future. Both these old maids and young mothers are treated like queens by their people thenceforth.

The wedding-flight goes on in the air. It is astonishing how poetic the students of Ants become at this picture. All of the hatred with which they were inspired by the anthropomorphic suggestion of dear old Brehm is forgotten and suddenly they regard the Ants as almost human. They think of their own wedding—of the dear wife who was once a maid—and live over that wondrous day with the Ants. If they have never been married, like the learned Father Wasmann, they wish that they could be Ants for a day—there in the heavens. Wouldn't we all like to be? On a day like this the male means something to the female. Male and female, of one or many peoples, surge upward. They form into swarms; the swarms become thick clouds. All love one another; each seizes another. Sometimes the wedding takes place in the air; others fall to earth, to belong to each other there. Three, four males catch the female, one after the other; but the bridegroom is not mangled, as among the Bees. They are very tender and affectionate, almost human, coddling and kissing each other as they embrace.

The wedding-swarm may cover a wide territory. Sometimes it is like a cloud, darkening the sun, or covering an entire lake. Flying as high as the church-steeple, sometimes it looks like clouds of smoke, so that fire companies have been called out to quench a fire in the church. Masses of Ants have been swept up in the street and in these heaps no less than thirty different species have been found.

Other Ants, other customs. Although this is the usual mode of celebrating the wedding feast among the Ant People, some species avoid it altogether. Among the Blood Red Ants, the males of a community take flight one day before the females, and in this way they encounter females of some other swarming people, thus preventing all inbreeding On the contrary, the Brazilian Leaf Cutters are as impatient as our own Wood Ants: the females yield themselves to the males in the nest. Other species such as the Horse Ants enjoy the bridal flight but do not form in thick swarms; they fly singly upon their love quest.

In those species in which one sex is wingless, there can be no bridal-flight; but it is notable that there is no species in which both sexes are wingless. Sometimes we find mixed communities in one nest, as among the Workerless Ants, where inbreeding prevails. In other species the winged creatures fly out seeking their fortune in strange nests.

* * *

After the great festal day, or the marriage-night, for some species swarm out at night, the serious labor of life begins for both sexes. The males, brainless, without weapons, or poison, incapable even of feeding themselves, soon die, if they have not been devoured before that time. With most of the females, it is not much better; only a very few of the many prospective mothers escape death and succeed in bringing forth their own people. Each one goes bravely on her way, hardly an hour after the wedding, to prepare for her arduous labors. The wings, designed only for the great day, are now of no use to her, so her first task is to rid herself of them. It is quite fascinating to watch the Ants tear at their wings with their feet, bite at them with their mandibles, rub them against stones or wood, until they break off, which happens very quickly.

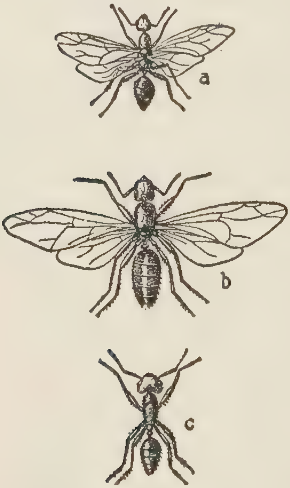
As soon as the young mother loses her wings, the symbol of virginity and the bridal-hour, she begins work. She was well fed in the warm home nest; cared for and guarded. She had never done any work, but now she takes hold, digging and working as well as the best laborer of her kind. Above all, she must prepare a refuge for the people of the future which she carries in her body. She needs a close small room for them; she digs one in the earth, under a stone, or in the bark of a tree, and stops up all openings. She labors unsparingly at this work—wears down teeth and mandibles, wears off her hair—never stopped by any obstacle, without resting a second, until her work is done. For weeks and months, sometimes for nearly a year, she works in this narrow room in which she has buried herself alive.

Soon she begins to lay eggs, which were fructified by the males in those minutes of the marriage, the seed which she has kept so well in her own little sac. She takes care of the eggs, as the workers used to do, licks them, cleans them; she helps the larvæ spin their cocoons, and the young as they slip out; then she feeds them.

We know that fable of the Pelican, the mother who hacks into her own breast to feed her young with her own blood—this story is told on many a coat of arms—but among the Ants the mother actually does feed her young from her own body. When she entered this nest she was well fed and plump, even the muscles of the discarded wings having changed into fat. This fat she feeds to the children in the form of saliva. Cut off from the outer world, she can get no food for herself. It is true that she eats some of her own eggs, but this is hardly for herself; it is only that she may give it to the larvæ from her crop in the form of liquid food. She gives them also some of the eggs to devour. This tireless mother even feeds the young creatures which have emerged from the cocoons, cleans and cares for them, until the chitin shield has hardened—until they are grown.

The young Ants are very small and unsightly as they appear, and all are workers, but the spirit of a national working people lives in them. They begin at once to help the mother, their Queen, who is now very thin, exhausted and weak; only a shadow of her former self. Her worst time is over, the foundations of the new state have been laid. She has accomplished the superhuman! When the Queen Bee flies high in the air, only the keenest, strongest lover secures her, and thus is the selection of the best insured; but with the Ants this great struggle for survival by the one best adapted for life rests entirely upon the female: one only wages the battle upon which many hundreds and thousands of lives depend.

The first care of the young worker is to make a way out of that narrow room—for it is only outside that food is to be secured for its mother and itself. The nest is enlarged, passages are constructed; just as the mother has fed her brood, so the brood now feeds the mother. Even the care of the eggs, larvæ and pupæ is taken over by the workers, who now form a large, strong body. Now the Queen changes for a second time. It is true that she does not regain the marks of her youth, as she remains wingless, toothless, hairless, and covered with scars, but with nourishment she recovers fully and becomes fat. Her ovaries, now the most important part of her body, develop amazingly; she can lay eggs in series after series, so as to build up a greater, more powerful people.



Male (a) Female (b) Worker (c) of Camponotus ligniferdus (*André*)

* * *

While this method of founding a state is common among the Ant People, it is by no means the only one. The stronger and more vitally alive the young mother is, the greater is the possibility for her to live through the starvation and to rear her brood. In some species, however, the fructified female can not do this alone; she has to look about for help. How she does this will be told later. The estimates of the number of citizens in an Ant State vary greatly. Some species, like the Narrow-Breasted, whose females lay only a few eggs, have only a few dozen citizens, while in other species the number has been estimated as high as hundreds of thousands, and with allied colonies running into the millions. No matter how large a people may be, it must finally come to an end; and its death seems to be directly connected with the death of the Queen. Even though she attain the unusual age, for an insect, of fifteen years, she must die at last. Some states, it is true, have vice-queens—in a very populous state, and as many as fifty, usually daughters of the race-mother—who assist her in increasing the number of the people. There seems to be no basic reason why a people of this kind should die out all at once upon the death of the race-mother.

It would, be possible, of course, for the workers to place their state in the control of the younger, fertilized females, when the old Queen dies, and in this way insure the perpetual existence of their people, but as a matter of fact, this is seldom done. In some unexplained way, at least one which we humans can not grasp, the life of the original founder of the Ant State is directly bound up with the life of her people. When the Queen dies, all the citizens are seized with a similar disinclination to live. We humans might call it mourning to the point of disgust with life. There are similar customs among men, in New Guinea and some of the South Sea Islands, where whole races commit a species of suicide after the death of a beloved prince. The individuals do not slay one another or themselves, but they prevent their wives from bearing children, and thus allow the tribe to die out. I myself saw a dying race of this kind on the island of Buka—and I witnessed a similar disgust with life, and slow dying out of a race of Ants, whose soul, their Queen, had been taken away.

In the Haitian voudoo cult the priestess bears the name "Mamaloi." The word means Mama-Roi (Mother-Queen) but in the degenerate French of the Haitian negroes the R has been changed to an L. It is a great, beautiful word, one which we can hardly translate into the mourning for the dark serpent-priestess. We have to search far and wide among men to find a "Mamaloi," Mother and Queen, but we find them in every Ant hill; there, in a very literal sense, the female is both Mother and Queen of her people. And who can question that she is their priestess as well? In her, all for which the Ants live and die is made concrete: she heads the simplest form of the strong national labor state.

The Bee Queen is born the queen, but this is not true of the Ant Queen. The right of the latter to queenship must be demonstrated through a strenuous struggle for existence; she must prove herself a conqueror. Many a female Ant strives for the great prize, but very few attain it. Every female Ant permits herself to be fertilized, not only by one, but by three or four males, one after the other. If, humanly speaking, we grant the love-choice to the Queen Bee, who selects only one and that the best and strongest lover, we shall have to deny the Ant Queen any right of choosing a lover. This, however, is greatly to the advantage of the race. She yields only in exceptional cases to her brothers; usually to males of other peoples, generally of the same species. Their children are the children of one mother, but of different fathers, so inbreeding is prevented.

After the wedding the Ant Queen behaves very differently from the Bee Queen. She is not a mere egg-laying machine; she draws her people closely to herself. She lays eggs and cares for them, as well as for the larvæ and pupæ, and does this all alone, starving herself to serve. Only after she has reared a group of workers to help her does she give over all the work to the young workers, reserving only the office of egg-laying. If you destroy an Ant nest, you will see how, if the necessity arises, the Queen herself takes hold to save larvæ and eggs and rebuild their nest. The Ant Queen, in a far higher sense than the Bee Queen, is in reality the Mother and Queen of her people.

The marked characteristics of Ants appear even in the first moments of being. The young Queens, all alone, ready to found a new people, must act as their own midwives, picking up in their mouths the eggs they have just laid. Later the workers assist their Queen when she is laying, stroking her, licking her, taking care of her fresh-laid eggs—yes, even helping to draw them from her body. When the mother has been fructified, she keeps the male germ in a little pocket throughout her life. As the egg passes from the ovary, it may or may not be fertilized by this germ. As a rule the progeny of the unfertilized eggs are male; of fertilized eggs, female, or workers.

The first dozen born of the young Queen are usually rather small, relatively weak creatures, but from the earliest moment the brood is nursed carefully. The care of progeny is developed more highly among the Ants than among other animals. Not only do they feed their young; they keep them clean and transport them from one place to another, if they deem warmth or moisture good for them. Some of the Ants even take their young out during warm nights, and carry them around for an airing, just as human nurses and governesses take the children to the parks. Within the nest the eggs, larvæ and pupæ are kept separately in the places best adapted for their stage of growth: medium-sized and larger larvæ in very damp rooms; eggs in dry rooms; pupæ in very dry chambers. As the heat and moisture do not remain constant, the Ant-nurses patiently carry their charges around, bringing them nearer to the surface during the warmer hours of the day and taking them deeper into the nest during the cold hours of night. Sometimes we find them sitting on the eggs to keep them warm.

The Ants treat their young very much as men do their children. To make the parallel complete, only nursing at the breast seems lacking, and even this may be found among the Ants that live in the Sunda Islands and the Philippines. These Ants have a highly developed breast, which would be admired by every mother or wet-nurse. They are insects, not mammals, yet they suckle their young. Like human females, they have two openings on the breast, making it possible to speak of two breasts. These Ants are very fond of anything sweet, especially of honey-dew—their cattle are the Leaf-lice and Lightning Bugs, which they milk—and the milk from their breasts is a sweet honey-dew milk. The observer can easily see this golden liquid through the transparent skin of the Ant's breast, as it shines through against the darker background of the Ant itself.

Unlike the nursing human mother and the females of all other mammals, the nursing workers of these Ants are all maids. They offer their breasts not only to the young brood, but also to their grown sisters and of course to the Queen—their sweet milk belongs to all their people.

These Nurse Ants are called *Cremastogaster,* meaning Expanded Hanging Stomach. It might have been more correct to term them hanging breasts, but even this is not precisely true, as the hanging part is below the breast proper.

It is true that all Ants know that young Ants taste good. They are very fond of these titbits. The captured brood of a strange people is devoured with delight, but each Ant's own brood is usually sacred, though at times an egg just laid is eagerly devoured, or the larvæ are fed with some of the eggs. This is quite cannibalistic, but it is a characteristic that is found all over the animal world; some birds devour their own eggs, and some mammals devour their new-born progeny, especially in captivity. Even to mankind this custom was by no means strange. In gray antiquity the gods were supposed to slaughter children year in, year out, and eat them up to boot. The entire relationship of the greatest of the Greek gods rested upon children who were devoured! Hera, Demeter, Hestia, Pluto, Poseidon were all eaten up by their father Kronos, and it was only because of their divine immortality that they were spewed forth alive. A myth—of course! But neither song nor myth ever took form which did not rest upon some actual deed of man.

(American Museum of Natural History)

A Nurse Ant Taking her Charges out for an Airing.

The eggs are carefully licked, and it is possible that this spittle is absorbed by the eggs, which would explain the growth that is observed so frequently. It is certain that the spittle prevents filth and protects them from mold. It also attaches the very small eggs together and makes it easy to carry them back and forth.

The larva emerges from the egg without eyes or legs, but with a well developed mouth. It manifests a remarkable appetite, and the more it is fed, the more rapid is its growth. Some Ants give the larvæ nothing but liquid food, while others feed them on whatever they themselves eat. Meat-eating Ants administer meat as a matter of course, feeding the larvæ with small insects or pieces of them, while the vegetarian Ants give their larvæ vegetables, and those using a mixed diet feed the same to their larvæ.

Some species of Ants have naked larvæ, but most of them are more or less hairy. This hairiness serves various purposes. It protects the larvæ from the bare earth, and prevents them from being gobbled up by some hungry neighbor. The hairy covering also helps in gathering the larvæ together for transport when the workers wish to take them elsewhere hurriedly in the face of threatening danger.

When the larva is fully grown it begins to enter upon the pupa-stage. The larvæ of some species weave cocoons about themselves, while others do not. Even in the same species we find some spinners and some non-spinners, so that in the same nest we find some pupæ naked and others in cocoons. The workers help the spinners by covering them with sand, burying them in the earth or covering them with bits of wood, which the larvæ later use to fasten their silk. The larvæ move their heads backward and forward and surround themselves with a fine silk. When they have finished the cocoons, the workers dig them out and remove every grain of dirt from the silk. These encased pupæ are popularly but mistakenly called Ant eggs.

In the cocoon the larva develops into an Ant, but without the aid of the workers it seldom can break its way out. The workers break the covering, so that the young Ant can slip out; and they free it from the pupa-cocoon. Thus the Ant is born three separate times, and every time a midwife is at hand to help. Without this care every young Ant would perish. The young Ants must be cared for until the chitin armor has hardened.

* * *

The time of development varies greatly. The growth in the egg may take from one to five weeks; the age of the larva is frequently much longer. If the larva passes into the pupa stage in late summer, the period of the larva is four to ten weeks, but if in winter, it may take several months.

It is the same with the time for the pupa stage; it may last three or four weeks, but very much longer when the pupa have to go through the winter. The tender young Ants are not considered grown until the armor has hardened, which may require several weeks.

The length of life of Ants corresponds more or less to this long period of infancy. The male, it is true, lives only a short time; almost always, he dies as soon as he has done his duty—that is, after the wedding, which takes place usually in the spring following his birth. If some of the males stay in the nest, they are treated cruelly and fed very little; sometimes they are driven out or killed. The workers live much longer; I kept some for more than three years in an artificial nest, and some investigators believe that they live for seven years. Queens may live much longer. It has been proved that they may live for sixteen years, an astonishing length of life in the insect world.

Marriage is necessary for humans if there are to be children—or at least, what we mean by marriage. The maiden must have her husband.

"Poor maiden," says the Ant, "must you have a husband? What if you have none?"

"Then I shall have no children!" answers the human maiden.

The Ant laughs at this. It can imagine nothing so stupid as that a husband is necessary for a maiden to have children. She may have a husband, of course, but why not have children without having a husband? The woman is everything and every female may have as many children as she desires—that is child's play. She need not even be a complete woman. Even a worker can have children, although she is only half a female. Yes, human maidens may learn something. It is so simple: the leaf-louse and the Ant know how!

* * *

As a matter of fact, among the Ants, the feminine workers sometimes assume the obligations of the Queen. (These are distinguished from ordinary workers by a larger lower body.) In some species, if the Queen dies, sometimes the workers feed one of their sisters with rich and special food so that she can lay eggs. This sister, of course, is a full grown Ant. A worker of this type has taken no part in any wedding; has not been fructified by the male. As a rule, the Ants from her eggs are males, but it is an error to hold that this is an absolute rule. In an artificial nest, I have myself observed, although none but workers were there, that eggs were laid from which came males and workers, but no true females. The idea that the sex or number of the larvæ may be regulated by the kind of food, as is the case with the Bees, has not been proved; on the contrary, it is most probable that the sex is determined in the germ itself.

I can not allow to go uncontradicted the idea that in some species the type of Queen has disappeared and in her place a permanent type of female worker has arisen. Such an idea is erroneous. Either these workers assume the functions of the true females in every respect—that is, they set aside permanent maidenhood, have a germ-sac and allow themselves to be fructified by the males—or, untouched by the males, remain workers, laying eggs as maidens, from which males and ordinary workers as well as feminine workers may develop. If they assume the functions of true females, there is not the slightest reason for considering them as other than true females—real Queens; if they remain workers, laying eggs as maidens, the species must die out in the course of a few generations, inasmuch as we know not a single instance in all the animal world, beginning with the amœba, in which unlimited parthenogenesis is possible. The natural pairing of the sexes must recur at some time. The true female must never be lacking; in some generation there must be a male and a real female who are wedded in regular fashion.

Even the true female, the Queen, may lay eggs parthenogenetically, and does so daily, accomplishing the trick of laying maiden eggs although she is no longer a maiden. She has been fructified for all her lifetime, carrying the male germs in her sac, and may use these or not as she lays her eggs. If she lays an unfertilized egg, it is a male; and these males are maiden-born, although born of one not a maiden.

The Ants do not seem to have solved the problem of parthenogenesis completely. The Leaf-lice have surpassed them in this respect. Among the latter we find generations of females only. These lay all the eggs, and from these unfertilized eggs only females are born. This continues through several generations, until at the end of the summer suddenly there appears a generation of males and females, which pair in regular fashion and thus break up the chain of feminine parthenogenesis. Their descendants are females only. That is logical and consistent—but what about that rule in Antdom that from maiden eggs only males come and no females? The males are entirely superfluous in maiden egg-laying; they are only useless eaters, of no possible value to their people!

No wonder then that the egg-laying workers in most cases devour their own fresh-laid eggs, from which only useless males can come, so that very few of them ever develop.

But here too are many puzzles. As yet we know but little about parthenogenesis among either the Ants or human beings.

CHAPTER II

SOME CHARACTERISTICS OF ANTS

No one can well hold that Ants are beautiful creatures, but we may acknowledge their social virtues and praise them as types for man to imitate—and this has been done from Solomon to Bismarck. They appeal to our esthetic sense as little as the Earwigs or Cockroaches; neither have they any of the characteristics that engage the good will of man for other creatures. We are interested in all things that may be useful to us in some way, especially in those that we can eat. We like Horses because we can ride on them, and Bees because they give us honey. We keep Birds in cages, because we like their singing, and keep Cats to play with. Besides its usefulness, the beauty or comic character of an animal holds the interest of mankind. The schoolboy chases Butterflies over the meadow or in the woods; he gathers Caterpillars only because the beautiful Butterfly emerges from them. He catches the slender Lizard, the beautifully tinted Salamander; he runs after the droll white dancing Mice, and the ugliest Ape provokes his laughter. He collects Beetles, because he is attracted by their peculiarities.

Ants serve no great or obviously useful purpose of man. They are not beautiful; certainly they are not funny.

For these reasons, man has taken little notice of Ants; a condition that satisfies the Ants very well, because the interest which man takes in those animals that are useful to him, which satisfy his esthetic sense, or amuse him, betides little that is pleasant for these animals.

We know more than five thousand species of Ants, scattered all over the earth. All kinds live in colonies, forming states, nations, communities—whatever it pleases man to call them. Some species have two castes, male and female. Usually, however, there are three: males on the one side, Queens and workers on the other. The Queen is always prolific; the workers usually barren. The males and females are almost always similar in form, but many types of workers are found. Females and males have wings, but some species have wingless females and others wingless males. The workers are always wingless.

Like the Bee People, the Ant People are feminists, but to a greater degree. The males, living only a short time, die after marriage. The number of prolific Queens is not limited to one, as among the Bees, but is far less than that of the workers. There may be fifty Queens in a colony of hundreds of thousands of workers.

The Ant is certainly the highest among invertebrate animals, as man is among vertebrates. The similarity between them is startling. Not only do we find many single points of similarity, but even in their historical evolution Ants and men exhibit many resemblances. In anthropology we speak of the Age of Hunting, Age of the Shepherds, Age of Agriculture, and to-day we find still, side by side with trading and industrial men, only shepherds, hunters or agriculturists. The same three ages are found in the evolution of the Ants: they pass from the most ancient hunters to the shepherds and then to agriculturists, and, as among Men, all these appear at the same time now.

As is the case with Man, so with Ants, they have few really dangerous enemies to them, if we except the parasites. Incidentally, some animals do feed on Ants, such as the Antbear, Woodpecker, Lizard, Frog, and a few Spiders and Wasps, but the few which fall a prey to these foes are negligible in number. They have one enemy that is very dangerous—and here too their similarity to Man is striking. As is the case with the races and nations of Man, so the Ants have been their own most savage enemies.

Are Ants more injurious or more serviceable to Man? It is difficult to answer the question broadly. Some species undoubtedly do harm to us and should be fought against, while others are so useful to us that they should be protected. Germany is the only country that has passed a law to protect these species, and in most of its states it is forbidden by law to gather the so-called "Ant-eggs" because of the service of the Ants in the forests.

All kinds of House Ants are harmful and annoying, especially Pharaoh Ants. Othes species make themselves very much of a nuisance in our gardens. The Leaf-cutting Ants of the tropics strip entire trees and bushes, including fruit-trees, while the Ants which attack cattle do still greater damage. Ants also attach their domestic animals—Leaf-lice, Root-lice, Caterpillars—to young roots and leaves, and thereby often kill the young plants. The Harvest Ants eat up much valuable grain.

The harm done by Ants in building their nests is very slight. It is true that Carpenter Ants bore through trees, letting in the woodpeckers, but although these peck into the trees, they do not hurt them irretrievably. The cork tree alone really suffers from these attacks.

Some Ants can bite and sting with considerable force; the prize in this respect I award to the Fire Ants of Dixie Land. Yet it must be said that only those who disturb their nest suffer from these stings and bites, most of all the investigators of Ant-life, and, of course, the Ant-egg hunter.

Fifteen years ago, Holzer, the old peasant shoemaker, lived in a Schneeberg village near Puchberg in the district of Rax. For a long time he furnished the aquarium at Schönbrunn with Ant-eggs. The Ants at the foot of Schneeberg enjoyed life very little so long as he was alive, for old Holzer gathered their broods and shipped them to Vienna for the fish. One day, however, when he had just thrown his sack over a great heap, he had a stroke of paralysis, and fell with his face amid the swarming Ants.

When he was found two days later, his face was frightfully eaten away—no one could have recognized old Holzer in him. The people in that village of the Schneeberg say that he did not die as he fell into the Ant-swarm, but that he still lived, paralyzed, and that the Ants ate away Father Holzer's eyes. That was the Ants' revenge, say they. No one ever again gathered Ant-eggs on the outskirts of Schneeberg.

* * *

But Ants may be really useful to mankind, as was first recognized by the Prussian forest-keepers. They stir up the soil, plowing and harrowing better than men can. They extirpate an enormous number of insects daily; some useful ones, but far more of the harmful kinds. It has been estimated that a large colony of Ants will take as many as a hundred thousand other insects to their nest in a single day. Wandering Ants, in the tropics, sometimes run into a human habitation, and even though the inhabitants may have to cleanse their homes of them for hours or days, they are considered welcome guests. Be that house filled with Lice, Fleas or Cockroaches, when the Ants leave not a trace of any other insect remains. They do not forget the Rats and Mice, and no rat-catcher ever did the work so thoroughly as they.

In southern China, the Ants have been recognized as hunters, especially in orange orchards, which are subject to a real plague of Worms. Entire nests of Ants are brought in, and are hung on the limbs in bags, or fastened to the branches of the orange trees. Bamboo rods are placed so that the Ants may pass from one tree to the other and follow their prey with ease. In similar fashion the care of mango trees is given over to Ants in Java to protect them from a devouring Beetle, and in upper Italy they help to protect the fruit trees from Caterpillars. In the United States Ants are allowed to fight the destructive Boll-weevil on the cotton plants.

In Germany, too, we have known, for centuries, that Ants could be utilized, although we have not availed ourselves of this knowledge very widely. Foresters hang a sack with an Ant-nest in it on the branch of a tree attacked by a plague of Caterpillars, and draw a band of tar around the trunk so that the Ants can not leave the tree. Then the Ants build a new nest in the bag and feed upon the Caterpillars in the tree. Our Wood Ants gather plant seeds usually, but they do not eat the seeds themselves; they eat only the fleshy covering, and throw away the seed. In this way they scatter the seeds of the plants they like, and we find violets and cypress spurge growing up all along their paths.

That Ants can strip an animal of flesh down to the bones is well known to every schoolboy who has put a dead Mouse or Lizard near an Ant-nest. In Mexico they also use Ant-nests for delousing. The garments, running over with lice, are placed on the nest and are recovered a few days later thoroughly cleansed. The Lice and Fleas are the payment given to the good Ants for their industry.

Ants are not unknown in medicine, also. Formerly formic acid, made from crushed Ants, had a prominent place in the drugstore. That Ants may be used for sewing up wounds is not so well known. Indian physicians utilize for this purpose the strong soldiers of the Leaf-cutting ants. They press the edges of the wound together and let the Ants bite through. After they have taken hold, the heads are severed from their bodies. The large heads of the Ants thus close the wound effectively. Ant-heads instead of catgut—the medicine men of the Brazilian Indians are not so stupid after all!

At least, the use made of Ants in European medicine a couple of hundred years ago was far less promising. In the famous "Book of Simples" of the wise Adam Lonicer, which was used up to the nineteenth century, we find this remarkable recipe:

> "Put a pot in an Ant-nest, covered with green leaves, so that the Ants will take their eggs into it. When you think you have enough, take away the pot, empty the Ants and eggs into a bag, beat it like grain until all are dead. Distill all in an alembic. Three drops of this water dropped into the eyes before you go to bed will remove all film and spots."

Beneficial as this extract of the Ants themselves is for the eyes, their eggs are just as good for the ears, according to the learned Dr. Lonicer.

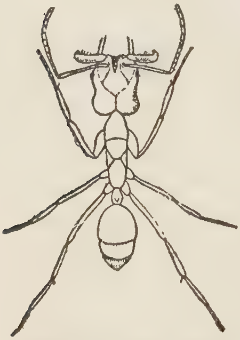
> "The best way to gather Ant-eggs is to place a wooden bowl or cup in an Ant-nest, covered with foliage, and the Ants will carry their eggs there. Draw away the leaves and the Ants run away, but the eggs are left in the bowl. In case the Ants are slow to depart, rap sharply on the sides of the bowl, and they will run at once. Distill these eggs through an alembic in a Balneo Mariæ. Three or four drops of this water put into the ears will restore the hearing and stop roaring in the ears."

If you don't believe it, try it. Possibly the Ants will be so accommodating as to behave as Dr. Lonicer says. In our day mankind is too well-informed to believe that diseased eyes and ears can be cured with extract of Ants, but in many countries the superstition still prevails that they are a specific for gout. All that is necessary is to put the naked foot into an Ant-nest and allow the Ants to sting for fifteen minutes. It is said that the most stubborn case must yield. This method of treatment is not very pleasant, but if it does not help, at least it can not harm. I have known old peasants who have tried this treatment and assert that it cures. Mankind also utilizes Ants as food. Not only are the pupæ (so-called Ant-eggs) used as food for birds and fish, but some men eat the Ants themselves. Every Indian and Australian negro considers the honey-swollen bodies of the Honey Ant a titbit.

This is no textbook. For this reason I shall discuss the outer and inner structure of ants as briefly as possible, as well as their evolution, variety and other things. I shall only touch upon the essentials which are needed for understanding the life of the Ants.

If there be any creature entitled to the name insect, it is the Ant. Insect—the cut-in animal, the animal which has a body in three parts: head, breast, posterior body, sharply separated from one another. The body of the Ant is enclosed in a sheath of chitin, which has some hairs at certain points for feeling.

The shape of the head varies more than among any other creatures. It may be round, elliptical, triangular, square, pear-shaped, heart-shaped, bottle-shaped. The upper jaws vary quite as much, depending on the work they are to do. They are used as weapons for fighting, for reducing the size of the food, for carrying booty or their young, for digging up the ground, for building and for many other uses. To the Ant they are what the trunk is to the Elephant—nose, arm, hand. They are also the tongue for taking up fluid food, and the wash-sponge for this cleanest of all animals. They and the lower jaw are the seat of the sense of taste.



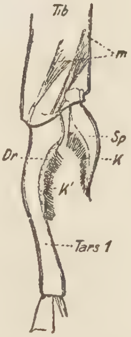
The open Mandibles of *Odontomachus haematodus* (*Wheeler*) The Jumping Ant

On each side of the head is an eye, which has little power of vision in some species. The males have the best eyes; the females, eyes that are not so good. The workers have the poorest eyes, and in some species they are blind, as there is no optic nerve. Still others have no eyes whatever. Besides these facetted eyes on the side of the head, the males and females—very seldom the workers—have an eye in the forehead, the purpose of which is not yet well understood. Possibly it serves for seeing in the dark. The feelers are the organs of smell and taste, both of which are well developed in Ants. The feelers also serve by taps for communication—they speak with their feelers as we do with our tongues. It is quite certain that Ants hear, but we do not yet know the organ of hearing. We shall discuss their senses more fully later.

The difference in brain in the three castes is notable. It is only slightly developed in males, much better in females, and best of all in the workers. These differences, however, are not so great as has been held. There are some species in which the females have the most highly developed brains, and in which they are rudimentary in males and workers.

* * *

The wings are attached to the breast section in males and females, as well as the six legs. The workers, whether male or female, are wingless. On the forelegs are the peculiar cleaning brushes, formed of two opposed combs. One of these combs lies on the long side of the leg, the other on a special spur. The Ants draw their feelers between these combs to cleanse them of all dirt. The feet also have gripping claws, so that they can climb, as well as flaps by which the Ants can climb smooth walls.



The Cleansing
Apparatus of Red
Ant. *Dr.* Gland–roll
K Spur-comb
K' Tarsal Comb
m Muscles
Sp Tibial Spur-End
Tib Tibia
Tars 1 1st tarsal joint
(*Janet*)

The posterior differs as greatly in the various species as the head. It may be round, elliptical, long, or heart-shaped. It is connected with the breast section by a thin rod. In some species a sounding organ is here, on which the insect can produce tones.

As to the stomach, we must note the difference between the crop-stomach from which Ants feed their young or companions, and the private stomach: they are separated from each other by the pump-stomach.

The ovaries of the Queen deserve special mention. When fructified by the male the germ is kept, as long as twelve years, or more, and in this way the Queen lays fertile eggs all her life. The larger these ovaries are, in some species, the more they take up from the male, the more they can preserve, and the more numerous the progeny that the Queen can bring into being. In workers the sexual parts are more or less arrested in development. Complete absence or arrested development marks them off from the Queens.

The poison-gland is connected directly with the sting, which is located at the extreme end of the body. It is lacking in the males, and is missing in Queens and workers of some species. The Ants that have a sting inject the poison into the wound made by the sting, while those without a sting inject the poison into the wounds made by their mandibles. Some species are able to squirt their poison several yards; and the effect of this poison is so deadly that even unwounded insects are made unconscious or are killed. Little is as yet known about the character of this poison. Besides these common poison-glands, some species have special poison-glands for protective purposes. They emit a liquid, which overcomes inimical insects by its acid or rancid odor. Man's invention of fighting his enemies with poison gases has been known to the Ants, and to other insects, for thousands of years.

Three stable forms are known in the Ant World: the winged male; the queen, a winged female; and the mass of Ants, arrested female workers. This classification does not hold universally, however. There are species in which there are only two kinds, naturally male and female, living the parasitical life without work. We also find wingless males or wingless females, and instead of one type of workers we have many kinds. As a rule the variations within any single species are confined to the females; the males, living only for the purpose of fructifying, and that for a short time, in the Ant State, usually are of a single type. But among the females, no other animals show so great a variety as the Ants.

The typical male is the handsomest of the Ants. His feelers and eyes—the eyes in the forehead, too—are the best developed, but his upper jaws are not usable either as weapons or as tools. The head is smaller than the female's and the brain is developed very slightly. The type of the male is not constant. In the Wandering Ants, he is a husky fellow with powerful mandibles. In the Workerless Ants, the male has lost his wings and looks somewhat like a degenerate female. Among other species the wingless male resembles the workers. In the Speckled Stinging Ants we find both winged and wingless males.

The typical female, the Queen, is largest in form, and is symmetrical in every part. An exception to this rule exists in the Wandering Ants, among which the Queen is astonishingly large but has no wings or eyes. In other species, as among the Amazons, besides the typical females are others that resemble the workers. The typical worker is wingless; it has no eyes in the forehead, and the eyes at the side of the head are not so well developed. The hinder body is small, and the sexual parts stunted. On the other hand the feelers, upper jaw and brain are especially well developed. Yet with these we find other types in great variety. In some species we often see workers of different size; some very small and others eight times as large. Between these are many grades, exhibiting many variations in bodily structure. The existence of workers of all sizes is usual in Antdom. In some species these variations in size of workers have ceased, only the size that seems best adapted for the activity of this species having survived. In such cases we speak of a uniformity of workers. When two sizes have persisted, we speak of them as biform, and the larger we term soldiers. The soldier has a larger head, much larger and stronger mandibles. Frequently the activity of the soldiers is exclusively that of fighting but sometimes they perform more peaceful tasks, such as cutting up any booty that is brought in, guarding the door, nursing the sick, bearing burdens, or acting as the Living Door.

Science is ever adding to the number of variations in the form of the workers. In some cases it is difficult to tell whether we have to deal with a new type. When scientists insist that pathologically misshapen Ants are special types and say that the very large or very small individuals, made so by disease or parasites, are special types, we must enter a strong disclaimer. Would we say that human dwarfs, or giants, hermaphrodites, hunchbacks, those with gigantic goitres, or suffering from elephantiasis are special types? Certainly not. Then why should we do this with Ants? How tremendous the difference in size may be within a single species is proved in the case of the African Thieving Ant, Carebara. In the cubic content of a single female of this species, eight thousand workers could find room.

* * *

As to the reason for these variations, all the wise men have broken their heads, and I was foolish enough to do the same thing. Every expert puts whatever other experts have said or written under the magnifying glass, examining all critically. Then he takes a thought here and a thought there, adds a little of his own, contradicts the theories formerly set up, and lays down his own. Finally, if he be honest, he admits that all is speculation; that no one has the least idea of it all, and that it is nothing but guesswork.

* * *

But I think that it is very fortunate that we do not know this, or many other things. How monotonous it would be if we knew everything! That is the greatest stimulus for all science, always raising new problems, always unveiling new secrets!

The secret of the varied forms in Ants is by no means explained. We do not know *how* it happens, or *what* causes it. *Why* it happened—that is easier to understand. The polymorphism of the females has given the Ant People extraordinary advantages; it makes the division of labor highly practicable, which is of great importance for creatures living socially. The *how* and *what* no one can say; if I try to realize the complete representation of the process, I am quite certain that there is no explanation.

The individual creature means nothing among the Ant People—the whole is everything. Whatever aids the whole is beneficial; that which hurts all is bad. In the case of no other creature, not even Man, are the young so carefully guarded and reared as among the Ants. Nevertheless the single egg, the single larva is nothing; both are quietly eaten up, or used for feeding others, if necessary. Nowhere else in Nature do we find child-labor save among Men and Ants.

The state is all in all to the Ants. The proper division of labor is of the highest importance for the welfare of the state. For this reason the popular thought demands division of labor, demands it so insistently that it is not content to assign one labor to one individual, other labor to another similar individual, but has produced special types best adapted for specific tasks. From earliest infancy onward this division of labor is fixed. The egg, which is eaten by the adults, or the larva used for feeding others, has attained its purpose for the whole. The larvæ of the Spinners serve as tools —and this is the unique instance in Nature, except man, where a creature regularly serves as the means of producing material. The young Ants just hatched, still very soft, whose chitin shield has not yet hardened, help in nursery work, but the real division of labor begins only with the adults. This may be observed easily in an artificial nest. All you need do is to tint the Ants with different colors and watch the individual labor. Certain individuals do nothing but bring in food, others serve as guards and defenders. Yes, I have proved that the work of cleaning up, removing débris from the nest, throwing it on the trash heap, grave-digging, carrying the dead to the cemetery, as well as nursing the sick, is assigned to special individuals. If therefore a division of labor is of great value to the state among similar individuals, how much more valuable must it be to produce special types adapted particularly for special labor!

Thus the aim and will for multiformity among the Ant People became vital to each Ant. The popular thought demanded multiformity and attained it—though the secret of how it was brought about is not yet unveiled to Men. The work of reproduction was intrusted to both sexes, while a by-form of one, the feminine, formed a special caste, which may be termed neutral—sexless—at least so far as concerns reproduction, as a rule.

The thought of the Ant People was working towards a renunciation of male coöperation; it desired an Amazon state, a purely feminine state. The males served only for the brief marriage, and what was essential for that was given them. They needed very good eyes, in order to find the female outside of the nest easily, but no brain was needed for this wedding; good sexual parts are enough.

The working Ants, however, acquired a brain. They were not needed for reproduction, as a rule, and so all their powers were reserved for labor, for the benefit of the state. And because individual Ants, once upon a time all alike, were destined to perform special work, in the course of time the popular will developed special types, best adapted to these different pursuits.

These shapes were not all fixed; they arose in the course of millions of years, and disappeared as the weal of the state required. It seems as if the spirit of the people was always making experiments, making an entire series of shapes, so as to ascertain which finally would prove best adapted to their aims. In some species we find very large and very small workers—and between the two a dozen different sizes. In the Narrow-breasted, we find a dozen different shapes, forming a chain from the Queen to the workers; the best adapted persist, and the poorest shapes disappear.

Even the caste of the workers may disappear altogether, when they are no longer required for the benefit of the state. This is the case with the Workerless Ants, which live as parasites among other Ants. As these other Ants feed them and do all the work for them, they find no necessity for workers of their own.

CHAPTER III

HOW ANTS LIVE AND WORK

The Ants are the cleanest creatures of all clean peoples. The American woman of the cultured class is almost painfully particular as to cleanliness, but she thinks nothing of dragging the filth of the street into her home on her dirty shoes, which sends a shiver through the Japanese, who take it for granted that they must remove their shoes at the door, and put on sandals before entering the house. I know how many women of Holland pride themselves upon the absolute cleanliness of their homes, abhorring a bit of dust, even on the ceiling, though they are rather shy of using water upon their own bodies. But all the cleanliness of the Japanese, the Dutch or Americans is as nothing to that among the Ants.

Cleansing tools are necessary, and the Ant has these in the highest perfection. On the front legs are comb and brush, with which it cleanses its feelers; the comb and brush in turn are cleansed by passing the legs through the mandibles of the upper jaw. The Ant assumes the most comical postures in making itself perfectly clean, for every speck must be removed from its body. If the dirty spot can not be reached with the brush, the Ant scrapes off the dirt by rubbing back or belly on some hard surface. After the dirt has been brushed off, the licking process follows—a real washing, cat-fashion. The spittle is rather oily, so that the Ant also anoints itself in this way.

As in all other endeavors, the Ants help one another in this cleansing process, to which they give up most of their leisure time, to their common enjoyment. They seem to take special delight in continually polishing up the Queen and the young brood.

Important as personal cleanliness is to Ants, the spotlessness of their homes seem to be quite as urgent. Examine the dusty, dirty Wasp-nest and then examine an Ant-nest. What a difference! All débris must be taken out at once. They have special "dumps," sometimes in a far corner of the nest, but usually outside of it. If anything is brought into the nest which can not be utilized, it is buried then and there.

* * *

Even more remarkable, the Ants bury their dead. It is delicious to note how the exponents of exact science state so solemnly, in presence of this fact, which they can not very well deny, that the Ants bury their dead indeed, but only because of their desire for cleanliness. Just as if human society had any other reason for the same ceremony. Dead bodies would be a plague in human habitations quite as much as in Ant-nests, and for that reason they must be taken away. If this were not the case, mankind would probably keep the dear departed in their homes, and the Ants might do the same. Many animals devour their dead ancestors at once. Why do not the Ants follow this custom, inasmuch as they devour other insects and even the Ants belonging to enemy nests? It can not be denied that Ants manifest a certain kind of feeling when their relatives die. Some species simply take their dead out of the nest, while others bury them. The assumption that the Ants have no feeling for their dead is quite as difficult to prove as the opposite—that they mourn for them—but the latter seems to me more probable.

Why should the Ants not feel for the dead when they manifest sympathy for the ill? It is true, of course, that a sick Ant lying by an Ant road will be passed by dozens of her sisters without the least compunction. They act as though they did not see the sick Ant, giving her a wide berth. Is this any different from the actions of human beings? Why should we tell the story of the Good Samaritan today in our schools? How many Men help a poor Man in need or illness? One out of a thousand. The rest act just as the Ants do, behaving as if they did not see the sufferer; going by with their heads full of their own affairs and troubles. Occasionally one stops to help—a Good Samaritan Ant—and this one is an expert in caring for the sick. I have often observed wounded or ill Ants nursed back to health by their sisters. These ministrations may last for months.

It is true that very severely wounded individuals are seldom nursed; those whose death is imminent are cast out of the nest. Just so the Spartans exposed their sickly or crippled children on rocky Taygetus. It seems to me more humane to give over the hopelessly ill or incurably insane to speedy death, rather than to prolong the agony of their lives as much as possible, as we Men do; it is a much sounder sentiment for the general good of the people.

Fresh air is one of the chief essentials in nursing the ill. The Ants know this truth better than all the other animals, even better than most men. Their nests are pierced in every direction by ventilating shafts, looking to perfect ventilation.

If cleanliness be one of the great essentials for health, the exercise of the body is hardly less important. The Ants, accustomed to physical labor from early youth, have certainly developed the greatest possible power of their bodies, raising their strength to its highest point. In proportion to their size, it is far greater than that of mankind. The Ants also indulge in sport and games, just as we do. They play with grains of wheat, or seeds, like cats, taking them away from one another, letting them roll, and bringing them back. Or they have boxing matches and wrestling matches, throwing one another, catching one another with their mandibles, trying all kinds of grips, a regular catch-as-catch-can bout.

It is easy to see that these contests are not in earnest. There are crowds of onlookers, stroking the contestants with their feelers and forelegs and trilling as they cheer. The Ants do not hurt one another, never using their poison weapons. That is nothing else than following the rules and not using barred grips. Very seldom does the friendly bout become bloody, as sometimes happens when peasants have their matches and lose their tempers, turning the harmless contest into bloody battle. These games of strength, according to my observations, are usually carried on by the Ants engaged in housework, which is easier and less straining than hunting or work outside of the nest. It seems as if these workers, shut up at domestic labor, take this method of gaining exercise out in the open air and sunshine. I have also observed that the workers engaged in work outside of the nest sometimes indulge in sports. I noticed especially among the Texan Harvest Ants, that one worker caught hold of the worker ahead of him with his mandibles and held on; then sometimes a third took hold on the second, and in this way they formed a marching procession.

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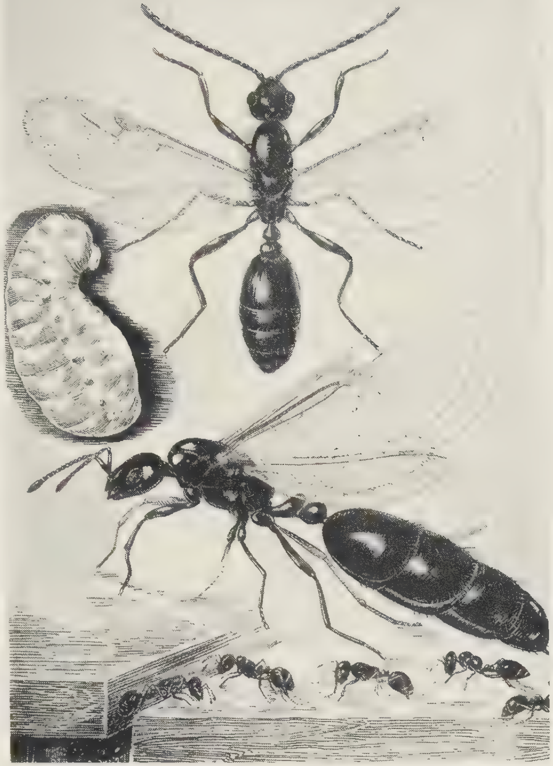
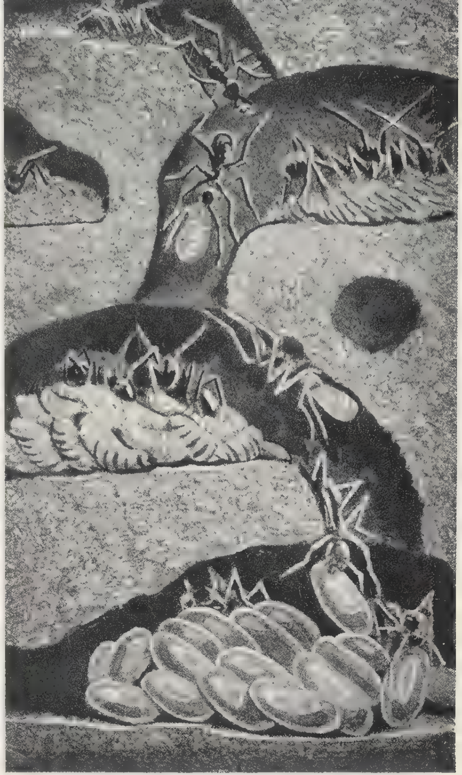
The Ants carry not only the ill or wounded, or eggs, larvæ and pupæ; often they pick up and



The Common Black Ant, Male above, Larva, Female Below.



Interior of an Ant-nest, Showing Eggs, Larvae and Pupae in piles in different Chambers.

bear away adult and perfectly sound sisters. This may be observed when they change their habitation, which happens quite frequently. Some species have special summer nests and winter nests, moving from one to the other, and other species move to another home when the one they occupy suits them no longer, either because it is too damp or too dry, too far from food supply, or too near some enemy people. There are always a number of workers who do not want to go with them. First they argue with them, stroking them and tickling them, but finally they take them up bodily and carry them out. Recognizing the fact that resistance is useless, the workers permit themselves to be borne away. Sometimes a few of the citizens stay in the old home—will not give it up—or come back to it, and even carry the brood thither. With infinite patience they are taken up again and borne to the new nest, until finally all are installed there. A removal of this kind may sometimes take several weeks to complete. Ants carry one another or their brood in ways as various among their species as among human beings. The Indians carry their young hanging on their backs; the Europeans in their arms. The Malays let them ride upon their shoulders.

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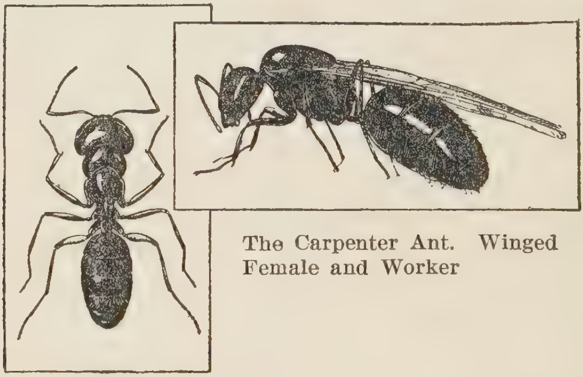
Sport is peaceful warfare and strengthens the body for the real game of war. No other creatures on earth have perfected war to so high a degree as Man and Ant. War is fundamental in Ant nature as in human nature—every little worker knows that. For this reason they do whatever they can by way of preparation for both defense and attack.



The Carpenter Ant. Winged Female and Worker

Varying as the nests of the different species do, each has developed some kind of protection against enemies. The Ant-nest is always a fortress. Special care is devoted to the construction of the entrances and they are carefully guarded, usually by those especially chosen as guards. The Carpenter Ant, Colobopsis, has a special Soldier type, notable for his very large head, which serves not only as guard, but as the door itself. The entry to the wooden nest of this eminent "Shriner" is just large enough for the Soldier to close it with her big head, and you can hardly distinguish the head from the surrounding wood. If a worker wishes to enter the nest, she raps, tapping on the head-door with her feelers. The Living Door recognizes the friend and admits her, only to resume her station again.

In many species, when working hours are over the entrances to the nest are tightly closed. If the fortress is attacked, the guards are the ones to offer the first resistance. Some of these undertake the defense while others hasten into the nest to spread the news. They do this by tapping their sisters with their feelers. This tapping may be considered Ant Language. Other species have a different method of spreading information; they beat on the wall of the nest with head or body very hard. The vibration is heard throughout the nest and is taken as the alarm signal by the sisters within the nest. Others have a method of making a noise with a special organ on the hinder body, which produces a shrill sound when rubbed. These Ants thus give a vocal alarm—they shout.

The action of the people thus attacked differs, as it does among Men, not only as to species but also as to individuals. Weak people rush forth in a mob and seek safety in flight, but in this flight the Ants are far more knightly than human beings. Any one who has seen a panic in a theater or upon a sinking ship knows how pitiable, how merciless, is the action of the stronger sex—with some exceptions, of course. Among the Ants, however, the order of every brave ship's-officer is obeyed implicitly: "Women and children first!" They save the Mother-Queen; they save the brood; save even the weak males if any are in the nest. The stronger sex in the Ant-nest is the arrested female, which compares most favorably with the male of humanity.

Populous states, of fighting stock, even though sometimes weak, wage battle with the besiegers. The action of the individual Ants is very different. While some of the workers are very valorous, and attack with Berserk rage, some of their sisters, thick around them, are arrant cowards. These run away, or pretend to be dead—a favorite and very easy mode of defense with some Beetles. Some play the "Wild Man," acting as though possessed, so as to make the enemy afraid, as happens not infrequently. It may be said that God is on the side of the heaviest battalions, even among the Ants, but sometimes a well fortressed small body of warriors puts to flight a far larger number of attackers. If some are taken prisoner, their lot is not a happy one. They are promptly torn to bits. It seems as though the captured workers know this; they do not struggle, but invite their doom.

The Ant's weapons first of all are the mandibles of the upper jaw; then the poisonous sting. The Ants that have no sting are provided with a poison gland from which they inject the poison into the wounds they inflict upon the enemy with their mandibles. Usually the battle is begun by the smaller Ants, which seem to use better tactics than the larger typical Soldiers. The latter must become enraged before they really take part in the battle—but then the result rests upon their efforts.

The battles—and the wars, too, which often last for months—arise from various causes. Frequently the contest is for a piece of land, which two peoples would like to annex, or the desire to take away land from the other. They steal the brood of the other people either to devour them or to enslave them, they steal their store of grain, or their cattle, or they take possession of the city from which they have driven out the owners.

After war comes the peace, for the Ants know how to conclude peace in many ways. Sometimes the enemy is annihilated, and all that he had is taken over. In other cases neither side has gained a complete victory, and each withdraws to its own nest or territory. A strip of land between the two peoples is declared neutral territory and no one from either side ever enters it. Sometimes it happens that a treaty of coöperation is entered into by former foes; in rare instances, where very weak peoples are concerned, an amalgamation takes place.

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A valorous people developed through sport and play, by ever continuous labor and hard fighting, and hardened by many trials, must develop great vitality. The power of resistance and virility of Ants surpasses that of all other creatures. We have seen the hardships that must be endured by the young Queen for months at a time to rear her brood. One day spent in observing the industry of each worker Ant will make us envious. But we are defeated, too, when we try to ascertain the virility of the ant. It is strange that none of the scientific investigators of Ant life has ever undertaken this investigation. It fell to the lot of a woman, an American investigator, to accomplish this purpose. She took Ants—a Queen, workers and the young brood—froze them and kept them for twenty-four hours in a temperature of 23° Fahrenheit. Thawed out then, all survived; even the young brood developed normally thereafter. She starved Ants; young Queens survived for fifteen months without any food whatever and managed to rear their brood. She kept Ants under water for eight days; when taken out, they revived. She cut off the head of one Ant; it lived for twenty-one days, and ran about until two days before its death. The astonishing power of resistance which Ants manifest against poisons is no less remarkable.

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The preachers of morals of all times who have pointed out the Ant to mankind as a shining example of industry and energy, have been only half right. There are loafers among Ants, just as among Men. We shall make the acquaintance of entire peoples who have succeeded in doing nothing at all, leaving all the work of the nest to other Ants, their slaves. Even the most industrious Ants—at least in northern lands—do nothing for months at a time. In the winter there is nothing to be gathered in the open; hunting, cattle-raising, grain-gathering stop. The animals remain quietly in their nest. They eat very little of their store, and do only the most necessary tasks. They do not really sleep, but they drag themselves close together and doze away. They are quiescent like the forest and field and many animals, and only when the storms of Spring sweep over the country do they awaken to new life.

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I have taken part in many meetings in halls, churches or in the open air, in all parts of the world. All seem to insult us through sound and smell. These masses of Men reek and shriek. Frequently our feelings are offended. Sometimes I have wondered why these human assemblies took place. Why did these masses gather here or there?

I have tried too, taking great pains, to attain the soul-state of the Ant, as a poet may do perhaps better than a scientist. I think I may have succeeded, but I never have been able to grasp the real purpose of the great assemblages of the Ant Peoples. For they do assemble, out in the open, and in the artificial nest. All at once they gather around, then sit still and quiet for many hours at a time. They do not talk to one another, they do not touch one another with their feelers. They move the hinder body slightly, as a dog wags his tail; they wave their feelers hither and thither, very slowly.

It is very striking, when you stop to think of it, that there is no animal on earth that works so continuously, with slight intervals for play, as the Ant. What then are the workers about now—what is the purpose of these assemblies? Are they consulting about something important to the state? Are they praying, as Men do in their churches? Are they thanking their Creator, that he made them the crown of the insect world? Are they singing a silent *Te Deum Laudamus* at the recollection of their latest victory over some enemy people? Or are they observing a day of rest; a day of assemblage; a quiet, contemplative feast-day after so much labor? Possibly it is none of these; possibly nothing that the human mind can grasp. Yet it may be that we shall be able to answer this puzzle some day—and I think that we shall know then that these assemblies of the quiet Ants have a very much more important intellectual purpose than all the assemblies of Men!

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Every human nation has its peculiar customs, usages and modes of life, and so has every Ant nation. Disparate, peculiar, yet much that is common to all. We may be struck by the peculiar, yet we must comprehend what is common first of all. Man and all other living creatures possess the urge to keep the species alive and perpetuate it. This urge exists back of all modes of life.

The most important care of each day is food. There are some species of animals that eat nothing but meat; others nothing but vegetables. We have species that eat anything, and others that are limited to a very strict diet. Among Men—and also among Ants—we find all of these at the same time. There are northern races like the Eskimos who eat nothing but meat; Hindus who eat nothing but rice; Arabs who limit themselves to dates. I know a Mexican Indian tribe which subsists exclusively upon sea-food— fish and mussels—while Europeans eat any and every thing that suits their palate. Antdom presents a similar picture. Like mankind, in the hunting age they ate meat only. Today we have these species, the Stinging Ants and Wanderer Ants. As a rule, however, the Ants of our day, like mankind, eat anything. Some species have adopted vegetarianism and a few eat only special foods, but all may pass over from one kind of food to all other kinds of nourishment. The meat-eating Ants devour dead as well as living food. If dead, no animal is too large for them to consume it entire.

A favorite food is the brood of alien Ants, but their own are not despised. One species has developed into a law the practice of consuming the grown sisters. The people of the soldier-eating Spartan Ants slaughter a number of their largest soldiers every winter.

Anything sweet tickles the palate of most Ants and, like human beings, they will not touch food that smells bad. They abhor the excrement of meat-eaters, but are very fond of honey, sweet resins and all kinds of sweet plant exudations. They extract sweet essences from other insects such as Plant Lice, Crickets and Wasps. This nourishment is actually vegetable in origin, merely having passed through another animal body.

As to purely vegetable products, Ants devour grains and fruits. The Termite Hunters, a species from tropical America, eat and feed exclusively on mushrooms. The Honey Ants, like many hunting peoples, gather great quantities of food and store it in chambers so that they may live through times of need. A miniature storage chamber—its crop stomach—is carried by every worker. When an Ant gathers food, she does not feed herself; this takes place only when she opens her crop-stomach and lets a little of the food pass into her private stomach. The crop-stomach is nothing less than a market-basket; a bag for food, comparable with the jaw-bags of apes, with the difference, however, that the apes keep the food, which they can not chew quickly enough, in the capacious jaw-bags until they can enjoy it themselves, while the crop-stomach of the Ant serves only in the smallest degree for its own nourishment—it belongs to the whole people. It is a social stomach, or better, a national stomach, for only in rare instances—and then to the injury of the people—are other creatures fed from it as members of the nation.

The Ant gathers considerable food, but needs very little for its own requirements; so little, that it is always hungry. Its national consciousness is so strong that it reckons itself in terms of welfare of the community. Only a portion of the people go in search of food while the others, with work highly specialized, attend to the housework. When one of the workers comes home another Ant approaches her, touches her with her feelers, strokes her with her front legs and licks her. They feed one another with a kiss, lay tongue to tongue and accompany this friendly intercourse with tender strokes of feelers and legs.

The feeder that comes home with a full crop is not content with feeding one, but passes from one to the other, distributing her gifts with a free hand. And even the others, which have been so tenderly fed, do not retain these gifts for themselves alone. They run to other hungry sisters and pour forth what they can spare in kisses. Of course, besides this feeding from mouth to mouth goes the passing from hand to hand. Some large bits of prey, vegetable or animal, are not first taken into their crops, but brought into their nest by the foragers as they are and at once given to their sisters. Besides these, the males and winged females, if there are any in the nest, the young, and especially the Queen-mother, are fed abundantly.

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If we compare the Ant-nests with the Beehives, the regularity of the Bee home surpasses in every way the apparently irregular, unsystematic Ant home. We might conclude that while the Bees had long since found the best possible nest for their young and themselves, the Ants were still in the dark and very far from the stage of perfect construction. Such a conclusion would be altogether false. As a matter of fact, the Ants are far superior to the Bees in the construction of their nests, as in every other respect.

The most astounding fact is not that some species build one way, others another; some on the earth, others under the earth; some in hollow trees and branches, and still others erect their fortresses on the trees. The most amazing thing is that one and the same species understands how to build its nest so as to conform best to altered conditions. The great variations in the nest building of the Ants when compared with the hard and fast system of the Bees is an extraordinary triumph. In one district in a forest, where floods occur, the same species that formerly built among the roots at the foot of the trees builds high in the trees. Another species will build its nest on the mountains under sun-warmed rocks, while in the valley the same species builds a warming earth-heap over the nest, and in the woods, builds upon tree-stumps. These little animals know precisely what is best for each condition.

Antdom knows every method of settlement, from simple living in holes to settling a considerable stretch of land with several city-settlements. They also know how to live in a rented home, either of other Ants, or of other animals, and sometimes after this tenancy take permanent possession by force. As a rule the city-state prevails: a people lives in a fortified city and considers all the land about it as its property. A further development which often follows is that populous cities found colonial cities, with which they are connected by well marked roads. In contrast with these are the emigrations from overpopulated cities, making up the journeys of the Nomad Ants, who know no fixed dwelling place, but pass from one hunting ground to another.

Some Ants, like the Blood Red Slave Hunters, have winter cities and summer cities and change their homes regularly. If the people of a community are no longer pleased with the city in which they have been living, they build another better one on some selected spot, and remove thither, compelling reluctant individuals to move with them. The abandoned nest may then be taken possession of by another people which alters it to suit its own needs and taste. It may be abandoned by this one in turn, be reinhabited by a third people who alter it again, so that it becomes a remarkable example of composite architecture. Also, an abandoned nest may be besieged by its former owners, or an inhabited nest may be captured after a hard battle and emptied by the slaying or driving out of all its inhabitants.

The typical nest consists of a number of chambers hollowed out, all connected together. There are exits to the open air, usually one or more, but sometimes none at all, for the absolute subterranean species seal themselves in, and open the city gate only for the great hymeneal flight. The irregularity of these chambers is as notable for the Ants as is the fixed form of the hive for the Bees. We human beings seem to follow the irregularity of the Ants in building our houses and cities, which may seem erroneous to Bees, but which has advantages.

When Men build houses, and cities, they proceed in two ways: they excavate and they build up in the air, often both at the same time, sometimes one way or the other. We excavate a hole in the earth, build the foundation walls, and the house above. We may desist from building the superstructure, and use the caves below, or dig more and live there. Or we may not dig at all and only build, either on the level soil, or high in the top of strong trees, on the water in houseboats, or in swamps on pilings. The Ants do precisely the same. They excavate or build—usually both together—and in their building they have the same irregularity, the same breaking away from the fixed habit of other creatures, the same adaptability to soil and climate, to mode of living and immediate needs, the same facility in triumphing over conditions through their own ingenuity. In a word, they display an intelligence, not equal to the human, but at least resembling it in many ways.

Different as the nests are in position and structure, just so are the materials of which they are built. They use earth, wood and stone, grass or dung, pasteboard, paper, silk—but the most elaborate of their buildings shows no such waste of labor as among the Bees and Wasps. In case of necessity the home may be abandoned and a new one erected in an astonishingly short time.

Therefore it is not easy to explain the nest-form systematically, for there would be errors or omissions in any such system. To give a bird's-eye view I shall discuss ground-nests, with or without a cupola; wood-nests, manufactured by the Ants, or utilizing hollows in trunks and branches, thorns, gallnuts; hanging nests, made of earth, pasteboard, paper, silk. Nor should we forget that we sometimes have a combination of two styles of architecture, and that one type passes over into another and that into a third. Besides, there are exceptional nests in all kinds of places and shapes.

The ground-nests have hollow chambers, connected with one another by tunnels. These chambers, of various size, have flat floors, and more or less arched roofs. The rooms serve as nurseries for the young brood, storerooms, rubbish-dumps; among the mushroom growers as hothouses; among the Mason Ants as quarries. Some species take away to some distance the earth which has been excavated, the apparent reason being that the presence of this city may remain unnoticed. These nests are all subterranean. Most species are not so far-sighted and timid; they heap the excavated earth above the nest, leaving the opening wide. In this way they build craters, heaps and a hill, in which the chambers and tunnels are hollowed out. On this part standing above the level, more work is done inside and out. They utilize not only the earth which was dug up, but also material from the neighborhood—earth, sand, small stones, bits of straw, pine-needles, bits of wood. An American Harvest Ant plasters the cupola of its nest entirely with pebbles, which it arranges almost like a mosaic.

This upper part may rise to the height of a Man —the largest Ant-hill seen in Germany was seven feet tall, and had a circumference of thirty yards. It is utilized in the upper rooms for the rearing of the young brood, as the heat there is considerably higher than outside. Usually this tower is fairly solid; sometimes, as among the Skunk Ants, Tapinoma erraticum, the tower is a very porous cupola of earth, through which the grass blades grow as supporting columns. We Europeans look in astonishment at the American skyscrapers, and are extremely proud of the steeples on our cathedrals, but what are these when compared with an Ant house which rises, under and above the earth, to a height of 10 feet? The cubic contents of an Ant building like this can hold a million times more inhabitants than the largest human habitation. Besides, settlements of an entire Ant People have been found in which over seventeen hundred of these mighty houses stood!

It is most entertaining to watch the Ants at their building. Their upper jaw serves as hand and tool combined. They dig, build, plaster with it; the front legs also are used to scratch up the earth, form balls of sand and tramp down the earth. They need no mortar for building the wall, nor putty or cement to hold the different bits together, therefore they build in damp weather. Some species, like the Harvest Ant, bring water from a distance. In addition to the water, they use their own spittle as a binder.

Instead of the cupola, many Ants utilize large, flat stones, not too deeply set in the earth. By building their nest under these stones, they save considerable labor and attain the same end, as the stones absorb the heat of the sun quickly and discharge it downward, and also serve as a good protection from the rain and many enemies. When they find no stone to suit, they may use logs of wood or cakes of dung as the roof of the nest. Especially young, weak people of almost every species build their first homes beneath stones. Some remain under the stone, while others build their superstructure over the stone, arching it in beneath their hill.

While the nests on the ground seem to be the favorite in Antdom, the wood-nests play a not unimportant part. The Carpenter Ants make the best wood-nests, in dead as well as in living trees. They are especially fond of the tenderer bark of trunks, or stumps, making the building extend downwards into the earth. The Living Door Ant is not afraid of the hardest wood, often selecting oak or hickory for his home. Smaller communities select hardened gallnuts, hollow thorns, nuts, fir cones or other hardened fruits. While the principal labor in the building of the ground-nests and wood-nests is that of hollowing out the chambers within, in hanging nests no such work is necessary. They are merely built of earth, paper or silk.

The Brazilian Gardener Ants build of earth. They carry lumps, one after the other, up the trunk of the tree, and fasten them to the branches and twigs. Plants shoot out from the ball-nest in every direction until the nest looks like a hanging garden.

Although the paper nests and silk nests do not look so ornate, they are no less artistically constructed. There are some European pasteboard workers, but most of the paper-makers, like the silk spinners, are inhabitants of the tropics. The German Paper Worker builds her nest wherever she finds a hollow, lining this hollow with an irregular, spongelike mass of walls. This paper is made by the Ants out of finely ground wood-dust with spittle as the binding medium. The paper walls are then tapestried with a special fungus, so that the walls have a soft covering. This fungus, hitherto found only in these nests, is cultivated by the Ants themselves. Its roots lend solidity to the paper walls. Possibly the fiber of this fungus is also used for food by the ants. Some North American Paper Making Ants build nests like these beneath stones.

Yet these Paper Makers are raw bunglers when compared with the tropical species. While the Northern Paper Makers can produce only very thick, brittle pasteboard, filled with wood or even with earth, their tropic relatives produce a paper that is comparable with the finest silk paper. In addition, their paper cities attain an astounding size, being sometimes more than seven feet long and a yard in diameter, large enough for a full-grown man to find room in it. Some of these nests are quite grotesque in shape; some look like gigantic beards, others like enormous stalactites hanging from the trees. The Tropical Paper Makers use sawdust, but they use comparatively little wood and much lime; that is, spittle. This is the secret of their fine paper. Only exceptionally do they utilize cow or horse dung, or earth. One species uses the seed-hair of the fruit of the silk-cotton tree.

The supreme artists in nest building are the Silk Spinners, Tropical Ants like the Gardeners and most of the Paper Makers. They produce a silky weave that is softer, but thicker, than the finest silk paper.

Besides all these forms of nests there is an entire series of irregular nests, which owe their shape and existence to accidental circumstances and needs. Among the builders of these, the House Ant is notable, the Pharaoh Ant being the best known. Originating in Egypt, the Pharaoh Ant has spread all over the earth and lives as an unbidden guest in human habitations. There is no nook or cranny, no hole in all the house, in which its nest has not been found—it seems to seek the most out of the way places, so that a prolonged search must be made to locate it. In the newspapers, from time to time, we read of the most unheard of places being chosen—they are so unbelievable that their truth is often doubted. A case was cited in Breslau, two decades ago, in which a skeleton was found in a funeral vault, but nothing remained of the clothing or coffin—all had been used by the ants for building their nest. I myself discovered, in a village of the Argentine Pampas, a colony of Ants which had made its nest in the head of a statue of St. Joseph, in the church. It was a wooden figure, fully clothed, with coat, collar and tie. The head, of course, was hollow. Through the left nostril, the Ants traveled back and forth, making it look as though Saint Joseph were taking snuff.

Outside of the nest proper, some Ants, just like humans, build special homes. Usually, around the nest built on the ground, the entire soil is swept clean, in a wide circle extending ten yards or more. Their roads are laid out very plainly, as almost any one can testify who has seen them passing. The roads are cared for most scrupulously; stones and lumps of earth are rolled away, and the blades of grass and other plants are clipped short, the earth being flattened, and sometimes elevated slightly at the center. In Mexico I saw roads like this, as wide as eight inches, extending eighty yards. In Africa, roadways of Ants have been observed extending five hundred yards, representing an enormous amount of labor when we consider the size of the Ants and the constant care required to keep the roads in condition. These roads lead either from their city into the open, to their hunting grounds, harvest spots, cattle-yards, or connect the mother state with smaller colonies. From some of the larger cities may be seen not one but a dozen roads leading in every direction. If the road is very long, sometimes resthouses are to be found on the way—small nest-holes in which the workers may rest, or take refuge in case of danger, or when it rains or the heat of the sun is too great.

Usually the roads are open, like our own country roads. Some species build covered roads, arching them over with earth or bits of plants. These are most frequently found connecting the mother city with daughter cities. Sometimes a part is found covered and the rest open. An open road may lead to an underground passage, which emerges further along into the open again. There must be some special reason for these variations, in each case, even though we may not understand it.

Similar paths lead from the nest deep into the earth. In these passages, which have many branchings on both sides, the Ants hunt their living prey. Sometimes they lead, like the surface roads, to the cattle-yard—to the Lice, which the Ants have pastured on the roots of plants. The Tree Ants have similar roads, both open and covered, connecting the sister cities, and also leading to their stock-yards.

The Ants often build stalls for their cattle. All of the Lice-milking species use the same material as that used in building their own homes—earth, dung, paper and silk. The purpose of the stalls is to protect their cattle from wind and weather, as well as from their enemies, and at the same time to prevent the cattle from getting away. These stalls, and the covered ways leading to them, also protect the Ants from the too glowing rays of the sun, which are not liked by the species of Ants fond of these cattle.

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Peculiar nests are built if several species inhabit one city, whether it be in friendly fashion, or when some species has been forced thither, one species having enslaved the other. We shall take up this subject of mixed states later. Here let it suffice to state that each species builds in its own fashion, so that a real composite is the result.

CHAPTER IV

THE HUNTERS

Science has assigned Antdom a place in its system, as it has done with Man, but this system is frankly filled with error, like all systems. The generally accepted classification of Ants recognizes five families: Stinging, or Wicked Ants; Wandering Ants; Knotted; Long-necked; and Hump-backed or Scaled.

It is assumed that Ants are descended from a wasp-like insect type, and it is a fact that the most ancient Ants bear some resemblance to some solitary Wasps. These are the Wicked Stinging Ants. All other species have developed from these. These Wicked Ants live in all parts of the globe, but they appear usually in small numbers. Where larger numbers appear, as in the tropics, it is in the most impenetrable parts of the country. They usually form small communities. Some families are very shy and live exclusively under ground, thus almost entirely losing the sense of vision. Others have special peculiarities, such as the Jumpers and Tick Ants, which can jump a foot at a time by using their mandibles.

Among these Wicked Ants the females, males and workers are of equal size; and all these castes are much alike. I write it designedly—female and not queens—for we can hardly speak of one Queen among the Stinging Ants. The female is a very lazy layer, producing a pair of eggs every four weeks, but the workers also lay eggs. As a result, the female is not treated as Queen-Mother. She works with the rest, and receives no special recognition. The workers are of one type; there are no soldiers. The nests are crude and inartistic.

The Stinging Ants are a hunting race, hunting all insects and living exclusively on meat. Their brood is not fed from the crop, as is the case with other Ants, but with raw meat. The booty is torn apart and the small bits are fed to the larvæ. Nor is the same care bestowed upon the young as by other Ants. The larvæ spin themselves into a cocoon, and when they want to get out, no friendly nurse helps them. They must strain themselves to emerge from the web. If they are not able to do so, they die in it and are then thrown upon the rubbish pile. Stinging Ants usually hunt alone or in small groups. Some races, however, have developed regular warlike tactics, and, forming an army, attack the Termites in a body.

It is rather surprising that this type of Ant—harmless, weak, timid and rather uncommon—should be called wicked. The one country in which they do full justice to this name is Australia. The special type of Wicked Ants produced there bears the impressive name Bull-dog Ants.

Australia is the country in which all nature stands on its head. Ferns are mighty trees; grass and heads of cabbage grow on the trees. There is an animal that looks like a tiger, with its black and yellow stripes, but which is as small as a mouse. The rats are very large, and they call them kangaroos. They have black parrots which eat meat; dim-visioned sea-urchins with pointed beaks, which lay eggs; other mammals which do not take the breast, but have a beak like a duck and lay eggs; living fossils—in a word, there is unusual interest in the flora and fauna of Australia.

The Ants play their part, too. Nowhere else are the Stinging Ants of any importance, but in Australia they give tone to Antdom. I swore eternal enmity with the Bull-dog Ants, a most unlovely race, growing to an inch in length. These creatures are not open to friendly intercourse; they are utterly opposed to scientific investigation, and know how to prove their objection most strenuously and painfully.

There are red, brown, black and variegated Bull-dog Ants, but all are desert dwellers. They dig their nests into the earth four feet deep, and may go deeper, in a day's time. A colony may count a thousand. Some are great jumpers, leaping a foot at a time. They seem to be fond of bathing and are splendid swimmers. And I know from personal experience that they can both bite and sting, for I had more than one proof of their prowess.

On one occasion I tried to rob a Bull-dog Ant city. I had good siege weapons—ax, shovel and spade—necessary tools for the lime, which is hard as stone. The door of the fortress was open on a hill, and I began my attack there. The Ants took up the gage of battle, but . . . the door was at the bottom of the fortress, right by my left foot. The storming horde attacked my trousers, within and without, jumping as high as my knees. I dropped my weapons and betook myself to headlong flight. The band followed me for twenty steps.

At a safe distance from the fortress I took up the battle with the beasts that had clung to me. It was not so difficult to get rid of those on the outside of my trousers, but for those which had made their way up the legs on the inside, it was not so simple. I was compelled to rid myself of the insignia of Man, by removing the trousers as speedily as possible—hardly a very dignified position for the great adventurer who had been so ready to attack the castle. It was a complete victory for the citizens—fine people indeed, whose city is a robber's castle supported by slaughter and murder.

When I tackled the males or Queens of the Bull-dog Ants, my plight was even worse than when I had to deal with the workers. It was a few weeks later. I was present at a hymeneal flight. The air was full of the loving creatures; many hundreds, possibly thousands, swarmed around me. I had imagined that upon so festal a day they might be a little more merciful, being concerned with love and nothing else. That was their chief concern, it is true, pairs flying and settling all around, but I was by no means forgotten. I believe that they wished to inform me that among the Bull-dog People the males and females could battle quite as well as the workers—and even better, because they could fly. I was attacked from all sides and felt their stingers, which are a quarter of an inch long. I never ran away so quickly from any other place. Since that time my zeal to learn more about the Bull-dog Ants has cooled notably. I know very well that I was no hero. I was a coward, but I did not feel that I wished to become a sacrifice to science. Others may attempt to study these stimulating creatures, which have not been closely examined. There is still a broad field for the eager myrmecologist, but let me warn him to cover every part of his person with steel plates.

* * *

Man can protect himself easily against all kinds of Ants; even the most savage and wickedest will not harm him if he does not interfere with them. The Wandering Ants may overtake him like a storm; they may come down like a hailstorm, or a swarm of grasshoppers, like a plague. A person may live for many years in the tropics without encountering a Lion, a Tiger or Jaguar, an Elephant, a Rhinoceros or a Tapir, but he will make the acquaintance of the Ants, whether he will or no.

All Wandering Ants are blind—those of the Old World have no eyes at all; those of the New World have eyes but no optic nerve. This applies only to the females and workers; the males can see very well. The workers are of all sizes, from the smallest mites to doughty burghers. They vary in color as well as in shape. The males, though winged, are three to four times as large as the largest worker, while the wingless female, with its distorted hinder body, only attains one-eighth the size. Both are so distinct from the workers that scientists have frequently erred in considering them a different species. As a consequence there was wild confusion in naming the different species, and this has not yet been cleared up, for the females of some species have not yet been discovered.

Of how the Wandering Ants rear their brood, or how the sexes get together, hardly anything is known, although it is clear that we have no right to speak of any actual hymeneal flight, since the females are wingless. The males swarm from the nest, especially by night, as these Wandering Ants, being blind, are more active by night, and avoid the sunlight.

I had my first experience with Wandering Ants in Mexico, to which I added later other observations in tropical South America as well as in the tropics of the Old World. The New tropical Wandering Ants are easier to study, because some species travel in the bright sunshine, while others, such as the Old tropical, appear only at night or on very cloudy days. As I read over my notes I find so much that is alike, and so little variation, that I can easily set down a general picture. I hold that the assumption of most students of Ant life that the Wandering Ants have no real nests, that they only have a kind of bivouac at a fixed place for a short time, is false. I am convinced—even though I have not succeeded better than any one else in investigating one of these nests—that nevertheless they have a home, which may be considered a permanent nest, inasmuch as they remain there for a considerable period, often for several months at a time. This seems necessary for the rearing of their brood. The Wandering Ants leave this nest at the change in the seasons, when the rainy season begins or even when the dry season sets in. They may leave, too, when the neighborhood no longer affords food for their tremendous numbers. Then they forage to a great distance, fixing upon a special place of encampment. While they are in their permanent nest, they go upon great plundering expeditions, from which they return to their nest. They are regular nomads, remaining in one place only so long as it affords the means of livelihood. They are Huns or Gypsies, traveling from place to place.

The robber-nests of the Hun Ants are carefully concealed, usually in the thickest part of the primeval forest, or in the impenetrable jungle amid the roots of old trees. They are defended from any attack by many hundred thousand warriors of infinite bravery. It is not only difficult to estimate the number of a nomad people like this, but even these estimates must be pure guesses. I have had to alter my own estimates frequently, almost giving up altogether sometimes when I observed the mighty army of these Ants marching in a seemingly endless line, covering a wide space as they went. Many travelers give the number up into the millions. I can neither prove nor deny their figures. At any rate, I saw armies more than four hundred feet long, while others mention armies extending to a length of fourteen hundred feet.

Some species march in broad columns as wide as thirteen feet, while still others march in serried columns; but the marching host is always so close together that a grain of dust could not fall between them. The earth is one black mass of the crawling swarm. The emigrations or expeditions usually take place at night or on cloudy, dark days. If they are overtaken by too bright a light on their travels, the army marches through covered ways or arbors. If this be impossible, they build arched ways of various kinds. Being expert engineers, even while the march goes on, they build these passages out of earth, using their spittle as the binder. Sometimes the larger soldiers form an arch under which the smaller soldiers march along.

To right and left of the line are individual marchers, usually of a different color, which we might well term orderlies or officers. They run hither and thither, each one seeming to have a certain part of the line in charge. These officers are quite different from the other workers; they have larger heads and very strong mandibles. At every attack they are in the front rank of the fighting host. In the center of the marching host are the smaller warriors. They carry the brood, eggs and larvæ, while the larger ones carry the booty. Very large warriors are stationed at various points as guards, and they protect both sides of the marching horde from any sudden attack.

The observer is thrilled as he notes the much larger males, with eyes at each side and on the forehead, and even with wings, as they march in the center! Yet this appears to be true only of one species in the Old World. At least I never saw them in America. The Queen is found very seldom, yet she appears on all the marches, even in the expeditions for booty. This taking along of the helpless race-mother is a kind of oppression. The under side of all the females thus far examined shows them to be most unqueenly; in a very deplorable state.

The mighty army is followed by a host of different animals. Some of these, birds of all kinds, exact their offerings from the fighting line. The greatest horde consists of insects, guests of the Ants who share their joys and sorrows, especially the small flies flying above the great army.

Wherever the Ant army goes, it spreads terror in the insect world, for its presence means sure death. Beetles, Wasps, Cockroaches, Woodlice, Centipedes are seized forthwith and torn to bits. It might be supposed that at least Grasshoppers could save themselves by jumping away, but such is not the case. They seem to be paralyzed by fright. Their hind legs are amputated at once, and soon they are torn to bits. As soon as the army reaches a bush, an alien Ant-nest, a heap of leaves, or any other rich booty, a large detachment led by officers advances to the attack. The insects which they pursue try to save themselves by climbing on twigs, stones or roots, but the Huns follow them everywhere. The prey in bewilderment jump down—into the midst of the black army. Only the Spiders at times succeed in escaping by letting themselves down on a thread and hanging in the air.

The nest of alien Ants is taken possession of at once. The nomads are quite as fond of Ant-eggs and larvæ as are other Ants. The alien people take up the gage of battle, but very seldom can they succeed in repelling the attack of the overwhelming host of the enemy. In most cases, every individual Ant is torn to pieces, and eaten, together with all the brood.

* * *

Every one who has lived in the tropics can tell stories about Ant armies which have paid him a visit at night. The Gypsy Ants may fear only the largest human cities, yet they seem to feel the obligation, from time to time, to see what they can get out of human nests. The bedposts are set in saucers containing vinegar or petroleum. If, on account of the heat of the night the sleeper has not thrown off the coverings, so that they hang down to the floor, he is safe from the invading hosts while in bed. I have enjoyed more than one of these visits, and managed to make my escape. We gradually learn how to act properly as host. But my first night with these dark maidens was bad enough. I shall not forget it, no matter how long I may live.

We had been drinking pulque, which is maguey whisky, preferred by the Mexicans above all other drinks. It has a horrible flavor and the head you get next morning is awful—but you must try anything once if you are traveling all over the world as a writer. I have drunk worse in my time. First you are very lively and then most emotional. We had been sitting for a long time, and had drunk considerable pulque.

Then I went home. I lived in a one-story bungalow which the owner styled a "chalet." I was taken care of by an old Indian woman. I did not go to bed at once, but sat down by the writing-table. I felt the uncontrollable urge to pen a sonnet—a sonnet to a Singsong girl I had met in Hankow, who certainly would not understand a word of it. If she had heard of the sonnet, she would certainly have attributed it to alcohol; but she was devoted to Saki, not to pulque—to rice-whisky, not maguey-whisky. I dreamt of her, and I wrote four lines about the sins of her slender fingers—and then four lines more; then three lines. . . . The last three lines I never wrote. The ladies came a-visiting—and I forgot her little finger, the Singsong girl, pulque and sonnet.

I heard a dim peep, peep. Then the peeping became louder; the peeping was intense. I jumped up, looked around; saw the floor covered with a black carpet. But this carpet was alive. It moved and crawled—many thousand black Ants. Half the floor of the room was covered with them, and still more were coming in. Like waves the black masses rolled in. Instinctively I jumped up on my chair. The peeping never stopped. Very fine, thin, many voiced; then a stronger, sharper, fearful peeping.

I listened. It came from behind the cupboard. Yes, behind the cupboard was a Mouse-hole and a Mouse-nest in which lived Mamma Mouse and her

Mouse children. I had heard them often as they squeaked, the little ones seeming to say: "Bring us something good to eat!" And the Mouse-mamma seeming to ask me: "Haven't you anything for me?" Every day I had shared my breakfast with her, giving her bread, cheese-rinds and sausage-casings. I called her Ignatz. She was a nice, lovely Mouse-mamma. Now she was being eaten up alive, she and her naked Mouse-children. There is no escape when the black six-leggers come.

They climbed my chair—ten, twenty, a hundred. Did they want to make me their prey? What did these blind things know of how large I was? Mouse or Man, all the same to them. I stepped on the table. My head whirled, but not from the pulque. A repulsive stench arose from the blackies, as of carrion, seeming to penetrate the pores of the skin, eating through clothing and skin. They came up on the table after me. They climbed all four legs of the table, swarming all over the chair as well. Its back was several inches from the table. At least those creatures could not reach me. I pulled out my handkerchief, wanting to sweep away all that reached the top of the table. They were coming over the edge, first a few, then more and more. I swept them off, balancing myself carefully. Wherever they appeared I hurled them down into that black, moving sea.

If only those Mice were dead at last, thought I, but they squeaked, and squeaked, ever more wildly, uncannily, hopelessly. Then I looked at the chair. It was entirely covered, legs, seat and back, but above where the curved back stood a little higher than the table, I saw a rare drama. Garlands of Ants were hanging there, as thick as your thumb—garlands of Ants! And I saw how their ranks grew, how one worker hung to the other. It was fascinating. I stood motionless staring down at the creatures. I knew that they were blind, that they could not see at all, yet they were coming from the chair to the table, forming a living ladder——

Now the first Ants reached the table and poured over a matchbox. Then the black hosts swarmed upon the ladder, and poured themselves all over the table. At the same time those climbing up the four legs of the table appeared, and the black flood rolled over the edge from every side. A second chain was completed from the chair to the table. I had to make but a single motion to hurl them to the floor, but the idea never occurred to me.

But I had to get away—the smell of carrion was more horrible than ever. In the next few moments they must reach me—I was nauseated at the thought. Hardly two feet from the table was the washstand and in the center of it stood the large pewter pitcher filled with water. There I would be safe. . . . One step. . . . I stood on the washstand, and in another I had both feet in the enormous pitcher. I noticed that the washstand was already covered with ants. Did they want to find out what soap tasted like? I had stepped among the blackies with my left foot, taking a half dozen into the pitcher with me. I fished them out of the water carefully.

It was a frightful pewter pitcher in which I stood. I had worried over it for a fortnight. Now I was very glad indeed that it was not china, which would certainly have broken. I stood straight as a candle, foot to foot. I will not say that it was very comfortable. I had to stand very carefully so as to preserve my equilibrium. Sometimes I lifted the right foot, then the left, in order to rest a little.

The army continued to stream into the room under the door. They covered everything now, creeping into my trunk, climbing on the sofa, clinging to the walls, here and there. They were more and more by the minute. It seemed to me that they were in layers, as if the black waves down there were rising higher. It is certain that they were climbing the sides of the pewter pitcher, and already were running around the edge. I could hardly bear my cramped position any longer. What if I were to jump down and leap for the door? Run down the steps and out of the house?

But I had the feeling that I would sink up to the knees in those black waves. I knew that it was unreasonable; knew very well that the Ants covered the floor only a fraction of an inch. Nevertheless I felt as if I would go in up to my knees. A stumble; slipping in the crushed mass; falling in the midst of them; the black, living sea swarming over me! Now, for the first time I became worried. I would not look at the Ants any more; I closed both eyes. But that peep, peep of the Mice which they were eating alive—and this gruesome odor of carrion and garbage. It seemed to me almost as if they had taken fast hold of me, as if my body, my own breath were emitting this disgusting odor. My head swam. I reeled, opened my eyes again, stood straight with the very last atom of will power.

Then I saw how the blackies were coming into the water. They hung on the edge of the pitcher, one after the other and dropped into the water, as they built a bridge over to me, just as they had constructed a ladder from the back of the chair to the top of the table. For a minute I was very still, watching them as they worked, seeing how they lengthened their living bridge, coming nearer and nearer to my leg. I could almost calculate how long it would take them to get there. . . . And again I became dizzy. The fearful squeaking of the Mice rang in my ears; the disgusting stench was sticky in my nostrils. My eyes smarted at sight of the black swaying waves. I thought that I felt the Ants crawling all over my body and biting me in a thousand places. It seemed to me that my mouth was filled with the black things. My tongue was parched, twisting with the awful struggle. Fear, fear—and a cold sweat! One loud shout of despair—then I jumped!

I do not know why I did not do that sooner, nor do I know why I did it just at that moment. My bed was very close, hardly a yard from the washstand. I might have saved myself long before. I made one leap into the middle of the bed. Without thinking I crept under the sheet and wrapped myself in it. I gasped—breathed—all danger was past. I knew that I was safe there. The four bedposts stood in pewter saucers filled with kerosene—not a black beast dared come near.

I closed my eyes again, held my nostrils. Still that squeaking, but weaker, slowly weakening. Other rustlings, which I could not explain to myself, from other creatures done to death, like the Mice. Then came the sharp cry of a Bird. At once it came to me that this was the Blackbird in its cage, belonging to the Indian woman. Would they eat him too? I wrapped my head in the covers—only to hear, see, smell nothing more.

* * *

The next morning the old woman brought me my breakfast to the bedside. She had great difficulty in awakening me; she did so most unwillingly, only because I had given the strictest orders. At once I thought of the night and the Ants I looked around but saw nothing strange. Had I dreamed all that? I asked the old woman if she had noticed nothing during the night. She nodded, smiling. Certainly, the "Tepeguas" had been there. She knew it at once. Whenever her bird screamed at night, Tepeguas had put in an appearance. She appeared highly pleased over their visit: no more vermin in the house, not a Rat or a Mouse, not a Lizard, a Spider, a Centipede, Lice, or Cockroaches. The bungalow had been eaten clean. The Tepeguas were excellent house-cleaners.

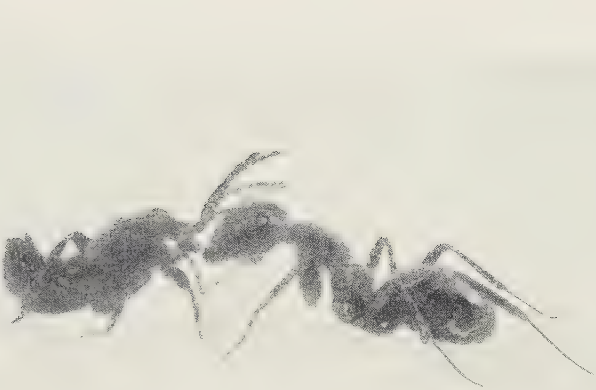
"But your Bird, your Blackbird?" She laughed. "Him? What could they do to him? His cage hung from the ceiling by a thin wire. No, he ate the Tepeguas—that was the reason he was so glad and screamed when they came in." She had gathered a couple of handfuls of them, and brought them in; a few that had remained behind lying near a Snake, of which nothing but the skeleton remained. Poor Snake, thought I, such a beautiful animal, with his blue markings and golden eyes. I had caught him a few days before in the forest, and put him into a wooden box, under the steps leading into the bungalow.

But now I must get up. My guide was below, waiting with the horses. When I came back in the evening all would have been washed up; strong-scented flowers would be there, so that I would not notice that strong odor of the Tepeguas.

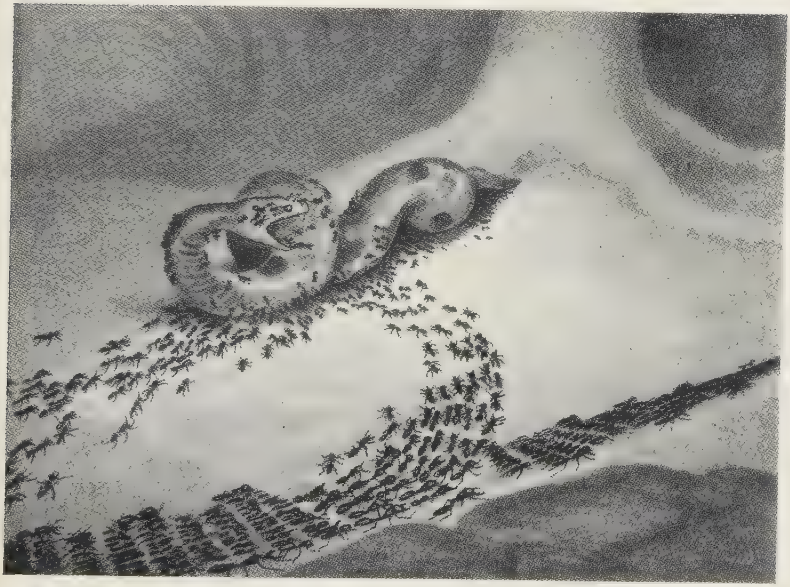
* * *

Since that time I have received several visits at night from these Wandering armies. They were never pleasant, but much more bearable than after drinking pulque and writing a sonnet. Those living with us in the house, the insects of all kinds, Rats, Mice, Reptiles, must perceive the odor of the oncoming army of Wandering Ants before we do; at least they become greatly excited before humans see or smell anything. They try to escape, which is not so easy, for the Huns absolutely surround the house and enter it from all sides. The Wandering Ants are also very fond of vegetable food—oil seems to be most acceptable—but they will not touch sugar or anything sweet—of which all other Ants are especially fond. They prefer meat of any kind, and they seem to want to kill their own prey; at least they did not touch dead Butterflies and other insects that I had left lying on the table.

In the tropics many astounding stories are told about Ants catching and eating large animals such as Dogs, Horses, Asses, Leopards, Apes. Of my own knowledge I know only that they have caught and eaten alive Hens and a medium-sized Pig. Yet I consider those stories probably true, especially if those large animals were enclosed and could not run away. The oft-repeated story that these Ants have devoured Boa-constrictors alive is more than possible. This gigantic reptile, after devouring a large animal, lies enormously swollen and helpless in the forest. Its very hard skin is



Ant Feeding Ant-nest Beetle, Mouth to Mouth.



A Horned Viper Attacked and Devoured by Wandering Ants, in Fifteen Minutes.

stretched from within, so that interspaces appear which the Ants can easily attack.

Their almost exclusively meat diet explains the carrion-like odor of these Ants. But there is another puzzle of which I have no solution: that the males and Queens of these Wandering Ants do not share this odor, but have a sweet, rather pleasant odor. Yet it is quite certain that their diet, like that of the workers, is almost exclusively of meat. Some other problems bearing upon the life of the Wandering Ant are still to be solved. We know hardly anything about the females; and what we know about the males is doubtful and often contradictory. Males have been observed marching in the army; they have also been observed flying at night towards a light, whence came the conclusion that they, like many other insects, leave the nest at night to swarm.

Hard as it is to find the permanent nest of the Wandering Ants, it is easy to discover their camping-places, used only for a short time, as they make these in hollow trees, stumps and holes in the earth. The real nest, if we may speak of it as such, consists at such times of themselves, very often. Their facility in building, utilizing themselves as the stones of the structure, is fabulous. They span a road, while marching, making an arch beneath which the others pass so that they may be shielded from the severe rays of the sun. They build ladders, in which one Ant clings to another, in regular living rows, sometimes a yard long, hanging to the ground from the branch of a tree on which they wish to camp. The rest of the community climbs up this living ladder to the branch. In a similar way, they build living bridges to cross a stream.

The camping nest is built somewhat in the same fashion, but instead of forming long chains, they mass themselves in huge balls. In the center they have their brood and their Queen, together with all their booty. They wrap themselves all around this, holding on to one another. A ball-nest of this kind may contain a cubic yard of Ants, uncounted and uncountable. The most astounding feature of this living structure is that it has channels running into the center and there is as lively running in and out as if it were a nest made of earth. The hunters are ever bringing in more booty through the living passages. So we see that they can make of themselves not only ladders and bridges but tubes as well.

The added peculiarity of the ball-nest is that it may move as a whole. In case of a flood the nest becomes a veritable living ark. The enormous ball floats in the water, with the brood and the Queen inside, until it finally rests upon some saving Mount Ararat.

CHAPTER V

THE AGRICULTURAL ANTS

It is not pleasant to deal with Bull-dog Ants, nor are the Wandering Ants to be despised, but by comparison with the Fire Ants or the Bearded Ants they are quite harmless. The pain of a single sting from one of the latter lasts for hours, and a couple of stings make a Man helpless for some time. The pain spreads through arms and legs; it is paralyzing, makes one dizzy and helpless. The sting certainly carries severe poisoning but what kind is as yet unknown. It is certainly not formic acid. I have never heard of its causing death, nor do there appear to be any permanent ill effects. After a few hours I felt perfectly well. Yet a large number of stings might well cause death—we know that in the time of the Aztecs, when capital punishment was inflicted, the Bearded Ants served as executioners.

Yet it must be said that, unlike the Wandering Ants, these Fire Ants or Bearded Ants never attack man without cause either by night or by day. They use their stings only when Man touches them or their cities. In such cases they prove that they have nothing to learn from the most advanced torturers or the most advanced punishers of mankind. A burnt child dreads the fire, and any child once burnt by the Fire Ants will make a wide detour around any one of their nests. A person must be a self-sacrificing priest of myrmecological science, or an inquisitive fool like myself, if he puts his nose into their hole to see how it looks inside.

In olden times, to be sure, the poets and sages were not so inquisitive. Among the Oriental, Greek and Roman poets we read some very wise remarks about the Ant; but they usually had to do with the Harvesting Ant. All of them observed Ants outside of their nests, no one ever seeming to think it necessary to look inside. So we read that King Solomon made the appeal: "Go to the Ant, thou sluggard; consider her ways and be wise: which having no guide, overseer or ruler, provideth her meat in the summer, and gathereth her food in the harvest." If the king had ordered one of his slaves to dig up a nest he would have found out that though they have no captain, master or prince, they still have a Queen, quite as noble as that Queen of Sheba of whom he made a friend. Nevertheless the royal proverb is correct, for this queen in Antland gives no orders, sends forth no messengers to gather grain at harvest time. The Mother-Queen is only a living symbol of the community-thought of the Ant People. In each single citizen lives the spirit to work for the community, none requiring any order from lords or captains.

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All Harvesting Ants belong to the third great group of Antdom, the Knotted Ants. While the Stinging Ants and Wandering Ants are almost exclusively meat-eaters, supporting themselves by hunting, the Harvesting Ants have adopted vegetarianism, though they do not despise a good bit of flesh when it comes their way. This development shows a higher evolution, brought about by the struggle for existence. There can be no question that the large Ant Peoples could be supported more easily if they were not dependent entirely upon meat, but at the same time used vegetables. Nature has provided them with the necessary implements in the powerful upper jaws, which are quite as well adapted for the killing and tearing apart of living prey as for breaking up and grinding grain. The peoples of most of the grain-gatherers are numerous and have large cities. These cities have been found over twelve yards in diameter, running seven feet into the earth and standing twenty inches above the surface. The deepest storerooms for grain are sometimes five inches in diameter.

Harvesting Ants live in all five divisions of the globe. They differ in many respects yet are alike in a general way. They are the best road-builders; and their nests are really plastered. They pass in long lines along their roads, busily engaged in transferring grain to the nest. Some species use one road to go to the place from which they are gathering grain, and another for returning with their burdens—"one way streets," we would call them. They are veritable harvesters. Not only do they gather the separate grains which have fallen to the ground, they climb the stalks and cut off the ripe grain, sometimes entire ears. Almost every kind of seed suits them, as well as any insects they happen to encounter on their roads or in the fields. These they kill and carry back with them as welcome booty.

Division of labor is highly developed. There are the workers of various types, and each one undertakes the kind of labor for which it is best adapted. The gathering and storing of grain offers manifold activity. There are some who do nothing but clip the grain from the stalk—the cutters. Others bear it to the nest—porters. Just inside the door they give their burdens to other Ants which take the grain and remove the husk. The husks are at once taken out of the nest, and thrown upon the rubbish heap, which is sometimes huge. It may be observed that the porters sometimes bring things which are of no possible use, either as food or for any other purpose. When these are surrendered at the door they are taken out very quickly to be thrown away. Any layman would say that a wise examiner sat inside the door whose duty it was to decide what could be used and what could not. This is certainly true. The Ants that receive everything at the door know very well what is useful; they are much wiser than the porters. I have often given these porters the most impossible things, such as matches, glass beads, empty snail-shells. The wise ones drop them or push them off their road. The stupid ones pick them up and carry them to the nest. There they are cast out promptly.

The Ants sometimes bring in green grains, small leaves, petals of roses or other flowers, but after a few days these are thrown out of the nest. They can not serve as food, but they may serve some other purpose which we do not as yet understand. Some Ants remove the hulls from seeds, and other Ants take the hulls to the rubbish heap. Smaller creatures take the grains to the granary, and pile them in order. That still others serve as nurses, midwives and caretakers of the brood and of the Queen, feeding and cleansing them, and doing all the housework, is a matter of course.

The granaries, often a hundred or more, are deep underground, in the driest places. Nevertheless it happens frequently that the seeds are moistened and begin to sprout. Then the Ants bite off the sprouts, and lay the seeds in the sun to dry. If they want to eat of their store, they moisten the seeds, so as to make them sprout artificially, gnaw off the sprouts and then dry them. Then only do they eat up the entire seed or grain. Certainly the Ants do not know that in the sprouting process the starch content of the grain is changed into sugar and that the drying out corresponds to the kiln-process in making malt, but they do know very well that grain treated in this way tastes sweeter and that it is easier to strip.

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Brioni, the island on which I am writing, is full of Harvester Ants. If I get up from my writing-table I need take but a few steps to reach their cities. The Duke of Civitella has charge of the horses and stables on the island. At first he thought that I was crazy when he saw me crouched for hours at a time, studying the ugly six-leggers, while he was jumping the hurdles accompanied by beautiful women. Now, however, when he sees me, he gets down from his horse. He does not jump the stone wall any more, and allows no one else to do so, for just there lives a large Ant People, to which I carry wheat and rice.

"Don Peppino," said I to him, "now I am going to show you something new. These dear creatures can not only gather grain, but they can bake bread of it." The tall Duke let his horse graze, lay down and stared at the ground. "Do you see their drying place, Don Peppino? And now watch, and see how they bring their loaves for the sun to bake."

Civitella took up one, and tasted it. "Rather bitter," said he. I nodded. "You are right, Duke! But the loaves are not finished! They will be sweetened again in the nest."

Don Peppino had never had anything to do all his life, except with horses—occasionally, of course, a maiden intervened. He shook his head, sighed: "That I should ever bother myself about Ants! No one ever sang to me about them in my cradle."

The grains had sprouted, and then been hulled. Now they were ground up, and made into dough with spittle. Reddish brown loaves had been shaped, as large as a peppercorn. These were brought to a dry place in the sun—the bake-oven of these small bakers.

* * *

That the Grain Harvesters are prone to gather where the harvest belongs to some one else is not remarkable. Antdom has strict commandments and obeys them far more faithfully than Christians do the Ten Commandments of Moses. The Law of the Ants is not written down but every individual citizen of each people feels and lives this law every moment of life. It reads: "Do all that thou doest for the welfare of thy People. Do naught against the well-being of thy People!" If then a Harvesting Ant People plunders the storehouse of another people by force, or steals grain from the barn of man, according to the Ant conscience that is neither robbery nor stealing—it is no sin, but a good deed. We humans do the same thing, when we take the honey out of a Beehive, or take the grain from an Ant-nest.

We do this very thing—in fact that very question has been settled by law, which establishes the ownership of the grain taken from an Ant-nest. That it is the property of the Ants, never for a moment bothers us Men, for all that is on earth belongs to *us*. All that we may argue about is to which body of Men the Ant store belongs.

The Jewish law settles the matter thus:

"The grain found in an Ant-nest amid the standing grain belongs to the owner of the field. If the Ant-nest be found behind the harvesters, the grain found on top belongs to the poor; what is below in the store-chambers, to the owner of the field. Rabbi Meir holds however: 'All belongs to the poor, for doubtful gleanings are to be considered as gleanings'!" (Mishnah Peah, Chapter IV, Sec. 11).

In order to understand this, we must know that the Mosaic Law ordained that at every harvest three things did not belong to the owner of the field: the gleanings (what the harvesters drop), the overlooked stalks uncut, and the corners of the field, which are left uncut for the benefit of the poor. Thus, the grains which lie on top, last brought into the Ant-nest, were evidently dropped by the harvesters, as they were taking in the sheaves—plainly gleanings, which belong to the poor. But the grain deep in the store-chambers may have been brought in before the human harvesters began their work. If harvesting had not begun the grain certainly belongs to the owner of the field, for no question of gleanings can arise. If the field has been cut, the nests being behind the harvesters, the upper part certainly belongs to the poor, the lower part to the field's owner. This last was contested by some of the legalists; thus Rabbi Meir, who held that where there was a doubt about gleanings, they should be considered gleanings, decided that even the lower stores belonged to the poor, as it was possible that some grains of the gleanings had been placed in the lower chambers by the Ants.

So we see how the poor and the owners of the fields may have argued about their legal right to the grain stored by the Ants. But it is by no means an easy matter to dig out one of these nests and recover the grain from the chambers which may hold a few handfuls of wheat. Notwithstanding all this highly sharpened juristical decision, the Ants seem to us to be entitled to enjoy their own store in peace and quiet.

* * *

It is quite interesting to see to what degree the Harvest Ants have interested the sages of Mediterranean lands. It is notable that the Jewish, Christian, and Arabian prophets fail to remark a notable characteristic of these Ants that live on the borders of the desert. Pious Moslems swear to-day "by the beard of the Prophet." If the Ants could swear, they too might use the same formula, for they have real beards.

The beard is possibly a beautiful adornment for Men—it certainly has no use—but it is quite otherwise with the desert-daughters of Antdom; their bushy beards have a special purpose. When they return from their harvesting, the workers are covered with sand and dirt. Their first care is to cleanse themselves and their burdens. They do this with the brushes which they have on their front legs; but that leaves these brushes dirty, so they want to cleanse them in turn. To do this, they draw the brushes through their beards, just as we clean our combs. This, however, is not all the purpose of the beard. The cities of the Harvesting Ants are built in the sand, and every grain of sand must be removed from the soil. They can carry only a few grains in their mouths; if they had a sack into which they could throw a lot of sand it would be very handy. The bristles of their beards serve as this sack. They cling together, holding fast to one another, forming a sack for each worker, which saves them many trips when they are building.

* * *

Without exception, Ants are ungrateful creatures. On one occasion I pulled a ball of Fire Ants out of the water—like the Nomad Ants, they form large balls, and allow themselves to be rolled along—and as thanks for saving them, they stung me viciously. And my warm affection for the Mexican and Texan Bearded Ants has been rewarded only by savage stings. Nevertheless I shall return good for evil and protect the Ants from the learned men of our day, who seem to try, in their writings, to make out that the six-leggers are very wicked indeed, and omit no opportunity of accusing them of being dull and stupid.

In treating of the Texan Bearded Ants, one investigator, in the sixties of the last century, said that they not only harvest but also sow, and that, especially around their nests, they plant the so-called Ant-grass (Aristida), the seed of which they prize highly. He goes further, saying that in the spaces around their nests, this grass and none other is allowed to grow. This observation was accepted by no less a personage than Darwin, who noted and published it.

But the exact science of our time pronounces this a pious fraud, a wicked joke at which every

Texan schoolchild laughs. The scientists explain it thus: the seeds of Aristida are moistened in the nest, begin to sprout, and progress too far to be stopped by drying. These seeds which have become useless in the nest are thrown on the rubbish heap by the Ants, where they take root. As further proof against the supposition that the Ants sow the seeds themselves, the following is laid down distinctly: (1) Some nests of the Bearded Ants have no Aristida; (2) Aristida also grows in many places where there are no Ant-nests; (3) The Ants often build their nests some thirty yards away from any field, upon some road; (4) The Aristida garden would never suffice to support the numerous people of the Bearded Ants, so they have to build long roads—and the presence of these roads alone is enough to reduce the myth of Sowing Ants to absurdity. This crushing argument has been repeated by one professor after the other, each one apparently being glad that once again he can destroy all evidence of intelligence in Ants.

Well, Professors, let us examine these proofs a little more closely. "Exact Science" has been attempting for many years to destroy the myths and legends told by lay observers of natural phenomena. The laity, travelers, poets, Nature-lovers have, however, in many instances proved themselves to be correct! This is notably true in the case of the students of Ants. Ever since the scientific study of Ants began, say about 1750, the learned scientists have laughed loudly at what the older classics, Hesiod, Æsop, Plutarch, Plautus, Horace, Vergil, Ovid, Pliny and many others related about the habits of Ants. All was either nonsense or humbug, mere poetic phantasy! It was a fairy tale indeed that the Ants went out harvesting, stored the grain in special chambers, prevented it from sprouting by drying it in the sun. But the investigations of the last decades have proved clearly and directly that each and every observation of the old myth-tellers was correct!

And let us not forget the Bearded Ants of Texas! Do you think, dear Professors, that you have proved the lack of intelligence on the part of Ants when you deny to this species the foresight of "who sows shall reap"?—when in other places you state that other species possess a similar foresight? If, a few pages before, you have said that the Gardener Ants sow seeds in their hanging lamps, the rooting of these seeds giving the necessary solidity to the round hanging-gardens, made of earth? If then, a few pages later, you say that an entire series of Ants cultivate mushrooms as food for themselves? All of this you do not deny—then why not be fair enough to admit that similar known or unknown foresight, showing itself as sowing in order to reap, belongs to the cultivators of the Aristida?

As to the four evidences cited against sowing by our Agricultural Ants, I must say that seldom have I seen such flimsy proofs of anything. Admitted, that a few seeds of Ant-grass may sprout sporadically around the Ant-nest. No one would expect anything else, and probably this first suggested to the Ants the idea of sowing. Why then do not the Ants cut off their sprouts, inasmuch as they do eradicate all other vegetation around their nests? Admitted that Aristida grass grows thickly there. Why shouldn't it? Admitted that these Ants build their nests sometimes on the roads, far away from the fields, especially when there is a farm near by, where they can find grain. What does that signify? Admitted that some cities of the Bearded Ants have no plantation of Aristida grass. It is a fact repeated a thousand times in Antdom, that one people has a custom which another people of the same species no longer has or has not inherited. Admitted finally, that the provision supplied by the plantation around the nest is not nearly enough to support the population. Would the kitchen gardens near any of our great cities begin to feed the inhabitants? Do not we humans build roads in every direction, along which our food is brought? Do we not gather our food over sea and land from the ends of the earth? Is it any proof that the grain-fields near the large cities owe their existence to accident? And how are we to explain that only Aristida grass grows near the nests of the Bearded Ants, and no other plant?

No, my dear Professors, this is not the way to disprove legends! You might be able to do so with schoolboys, for I must acknowledge that I do not admit any great authority for schoolboys (even if Texans). The nonsensical tales of Æsop, Solomon, Vergil are proved true, even the most fatuous pedants can no longer deny the truth of the "fairy tales" about the Harvesting Ants.

If scientists regard skeptically whatever the laity, travelers, artists, poets of Nature relate of their observations, that is their right, but they must not take it ill in us artists if we, on our side, take what the scientists tell us for what it is—stupid work, in which the gift of the artist, to conceive something intuitively (some rare cases excepted) is altogether lacking. Dame Science ought to begin really to be a little wiser. I must continue to believe the fairy tale of the Sowing Ants, and I am convinced that future really deep study will establish its truth, as well as that of the Ant legends of the ancient poets.

CHAPTER VI

ARTISAN ANTS

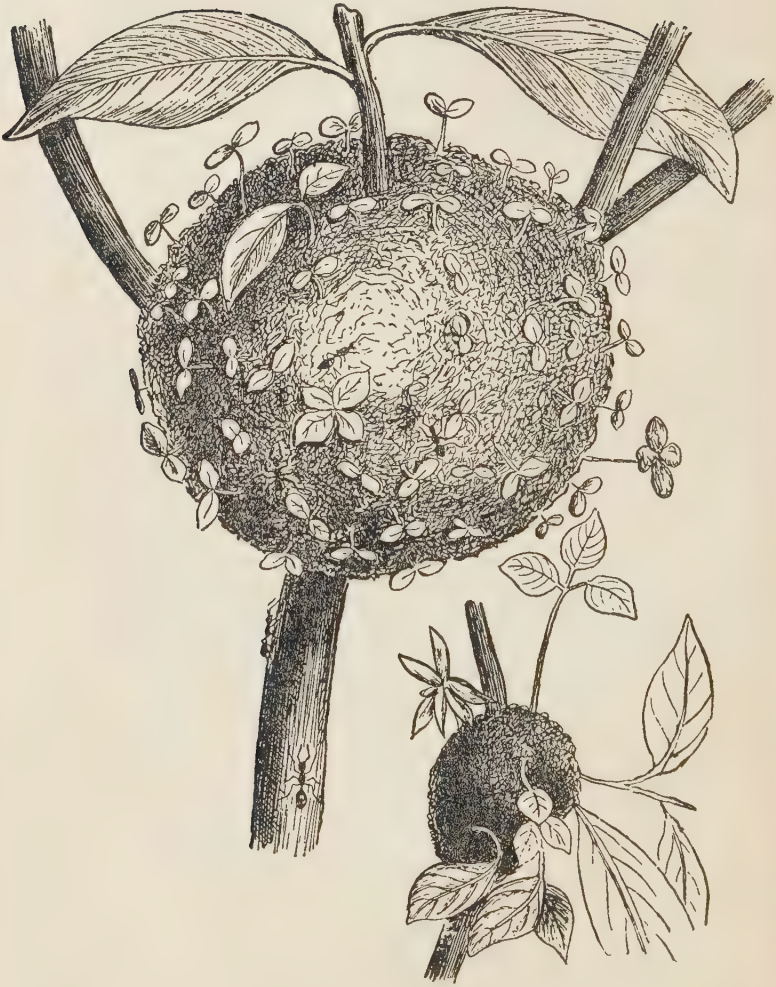
In some earthly creatures we find a calling, some artistic gift, a talent which may be developed to perfection, but only among Men and Ants do we find a complete series of artistic powers.

In Antdom we have Spinners, Carpenters, Paper Makers, Roofers, Hunters, Agriculturists, Bakers, Miners, Herders, Coopers, Plasterers, Mushroom Growers, Tapestry-makers, Gardeners, Cutters, Nurses, Governesses, Sick-nurses, Soldiers, Scouts, Guards; there are professional Slave-holders, Thieves, Robbers, Loafers. Of course mankind has some others, but among the Ants there are callings not known to Man; for instance, the profession of the Living Door, among the Carpenter Ants, or the Living Cask, known among the Honey Ants, both quite as strange to man as the Compulsory Regicide.

* * *

If in the primitive forest of the Amazon River the Mushroom Growers—Leaf-Cutters of the Atta family—strip entire trees in order to get the soil for their hothouses; if the majestic beauty of the jungle is often laid waste by these Ants; it is nevertheless the Ants who lend a phantastic beauty to the primeval forest, found nowhere else in the world. The lofty forest has no room on the earth for whelming beauty, for none save shade-loving plants can grow there. Whatever loves the sun must go up to the tops of the trees. Thus the orchids blossom on the ancient trunks, and lianas climb high thereon. There may be seen over and over again thick balls of flowers and plants, high up in the trees, which have the effect of great haloes or glowing lamps, filled to overflowing with blossoms, and these flowers are not parasites, like the orchids. They do not grow upon the trunks themselves; they are rooted in hard lumps of earth plastered about the branches of the trees. The artistic effect of this rare beauty, the flower-lanterns hanging in the primeval forest—and it is artistic—is not due to human art but to the art of the Ants.

We know various species of Ants that build these hanging flower-gardens, among them the Humpbacked Ants and several varieties of the Azteca family. One species of these Azteca Ants is named *Olithrix,* which means hair-destroyer, referring to the hair of the forest—the leaves. But I do not view them as destroyers at all, for they weave fair locks on the heads of the giants of the forest. Each species builds a different kind of garden. After a little experience it is easy to distinguish one from the other, but in the great picture of the primeval forest their hanging gardens are alike

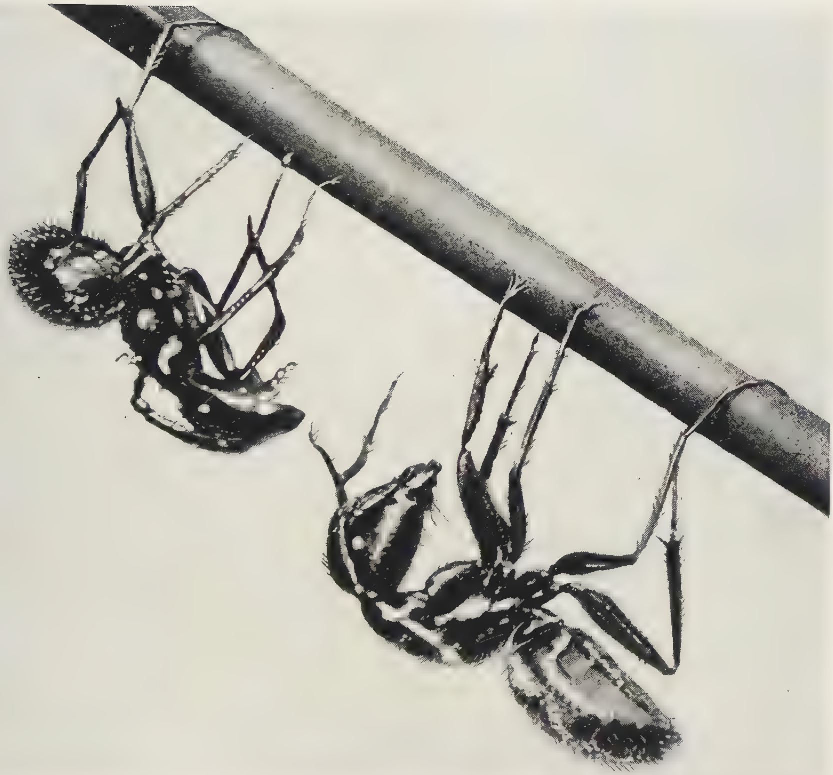


Two types of Ant Gardens of the Amazon

phantastic. They are found everywhere, sometimes at the very tip-top of the trees; at others, among the bushes, not far from the ground. Every grain of earth is carried thither by the workers themselves, and fastened between the branches or under the bark. One particle is glued to the other, as the ball grows in size. Soon it is as large as a child's fist, then as large as its head. Then the Ants carry seeds there and sow them in this earth. As the ball grows so do the seeds. There are the pineapples with white and yellow blossoms and other plants allied to our gloxinias, with light violet, clock-shaped blossoms; arum plants, philodendra, sending down their long air-roots into the earth; pepper plants, with a kind of cactus among them, and a wild fig. These figs too, like the philodendra, send out air-roots, which cling around the tree in which the garden hangs. Then the Ants carry earth to these clinging roots, building new gardens in these places.

The Gardener Ants sow the seeds; not, of course, with the object of gathering any harvest. They build their nests high up in the trees so as to be protected from floods, but the ball of earth is very fragile; a strong wind or one of the cloudbursts so common in the tropics would reduce their airy city to nought. The plants help here, piercing the ball of earth in every direction with their roots; making it strong and solid. Within the garden, between the twisted roots is the nest, made up of chambers and passages, made more or less irregular by the twisted roots. It is not to be wondered at that these hanging lanterns are a thorn in the side of science. They can not easily be denied. Whoever has not seen them in the ancient forest, may see them in numerous photographs. They belong among the most beautiful of tropical growths ever seen. There they are—I have seen dozens of them myself. It is evident that the Ants have taken every grain of earth there to form these balls in the trees, and just as evident that they took the seeds, wherever they found them, into their nests. Every scientist must admit this whether he will or no. But . . . the *sowing.* If this were admitted, we would have to grant the Ant intelligence and a certain foresight, and that must not be done, under any circumstances. If you do grant this, you will be tainted with the title of working anthropomorphically, like old Brehm, the blunderer!

What do the pedantic scientists have to say? They save themselves from admitting the intelligence of the Ants, happily suggesting that the Ant Gardens owe their existence to pure accident. They claim that the Ants build only their earth nests up there, and take in seeds only for food. That the wonderful wealth of blossoms grows out of the nest, is very simply explained by the sprouting of the seeds taken there by the Ants—or, perhaps, the dear wind has wafted the seeds into the hanging nests!



Two Carpenter Ants—Resting after Work, Upside Down.

Admirable! but they are flying in the face of facts. It is one of the peculiar faculties of all Grain-gathering Ants that they know how to prevent grain from sprouting—nor does the precious wind seek out seeds especially to whirl them high in air. As a matter of fact, only certain plants are found growing in the hanging gardens of the Ants; they are so special that in some cases these plants are not known outside of the Ant gardens, and in the second place, each species of the Gardener Ants picks out special kinds of plants. Only a few of the species of Philodendra are found both in the gardens of the Azteca and of the Humpbacked Ants.

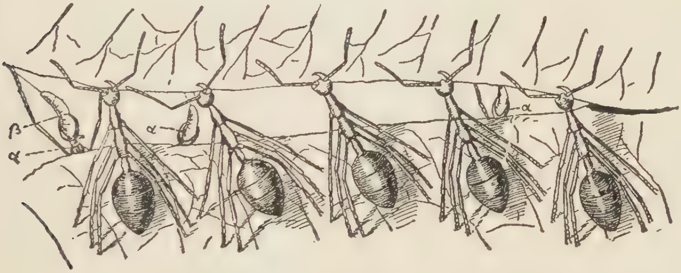
May we then any longer speak of accident or the play of the wind? It must be a foresighted intelligence which hangs the beautiful flower-lanterns in the primeval forest. Even though I respect the wind most highly, according to all scientific suggestion I must decide not in its favor but in favor of the Ants.

* * *

The fact that Ants can spin and that they use distaffs and shuttles is one more thorn in the side of scientific pedants. When, a couple of decades ago, this information was brought back home by travelers, the scientists refused to believe it, and pronounced it one more pious myth. It necessitates considering Ants as creatures, who have developed perfect foresight, which is most unwelcome news to these gentlemen.

The Spinners, of the Humpback family, are inhabitants of the tropics. We know Australian, African, Asiatic and American species. One species builds its nest in the earth, but most of them live in trees. Each has its own method of nest-building. Thus one species, the "Long-weavers" of Ceylon, builds the nest for its small people on a tree-leaf, using parts of plants and pebbles which are spun together in a fine web with silken threads. another species of the "Long-weavers" uses the silk fibers not only to hold the leaves together, but builds a nest all of silk within the leaves. A third species of this family goes still farther, spinning the nest entirely of silk, and inserting it into a hole in the earth, like a bag expanding downward. The Spinners of the Leaf-house Ants in Africa and Australia and the Brazilian Humpbacked Ants, exclusively tree-dwellers with large communities, build very extensive silken nests, utilizing living leaves and entire twigs, which are bent and spun together most artistically. And what fine names science gives these poor creatures! Camponotus *senex, Oekophylla smaragdina, Polyrhachis sinigera*—they sound well, but who save the pedants can get any meaning out of them?

When the first Spinners' nest was shown to the scientists they said that it was very easy and simple. They explained that the Ants had glands like those of the Spider, but that theirs were in the upper jaw. They said that these salivary glands served the Ants for many purposes; that they used the saliva to bind together the raw material with which they built, thus making pasteboard and paper out of wood, and that the spinning of silk was nothing else than a further development of paper-making—purely an instinctive function.



Ceylonese Silk Spinners at Work

As a matter of fact, the Ants do not take the material for spinning from their own bodies. They can not spin threads when they are grown; only the larvæ can spin. Nature has given the larvæ spinner-glands, so that they may wrap themselves in a cocoon during the pupa period. When the Ants utilize their larvæ in spinning the nest they are working contrary to Nature, utilizing the larvæ for something undesigned and unexpected.

We can hardly conceive any sight more thrilling than the nest-building of the Spinner Ants, especially of the Grassgreen Leaf-house Ants. The division of labor is specialized to the last degree. First, the task is to connect the edges of the leaves which should be joined. For this purpose the Ants build living bridges and ladders from one leaf to the other, in which each leader is grasped firmly by the jaws of the one behind. When they have reached the other leaf, they pull and drag from both sides, to bring the edges together. As if at command, they pull back, like pulling on a living rope, and the edges of the leaves come closer and closer. All at once, a host of other workers crawl up, each having a larva in her mouth. These workers, by hard pressure, force the larvæ to release the silky saliva from their mouths, then hasten over the living bridges with their burdens and press the mouth of the larvæ on the edge of the other leaf. In this way a thread is spun, and passing back and forth, weaving one thread after the other, from leaf to leaf, they make the web thicker and thicker.

The larvæ are not asked whether they will or no—they must learn thus early that, among their people, it is not the individual but the welfare of the state that counts. A second layer of threads is laid over the first, then a third and a fourth, until the web is made solid. The living chains are loosened, one by one, as the leaves are made fast by the web from within, and the workers on the inside continue their spinning.

In this way the leaves are joined together and the entire interior is tapestried. The amount of silk provided by one larva is incalculably great. Their glands, which open into the mouth, are extended throughout the body, and must be exceptionally well developed. The larvæ yield all they have for the building and tapestry of the nest, leaving nothing for themselves. They must renounce the spinning of a warm covering for themselves, and pass through the pupal stage naked thenceforth. This is probably the reason that the workers select the medium sized larvæ for their spinning. The larger ones, nearing the final stage, having long since exhausted their power of silk production.

The Spinner Ants furnish—and this is unique in the animal world—a material for the craft. This material is, however, the children of the people. Here we have to do with a real child-labor problem. Among men, child labor is exploited by conscienceless parents or guardians, while in Antdom it is for one purpose, which alone can excuse it: the common welfare of the people. The Spinners proceed in the same fashion in improving the nest. The older web is cut very carefully, and thrown to the wind, the leaves being again brought together and fastened to one another with fresh silk.

To be sure, it is not easy to observe this spinning of a nest. The single thread is invisible to the naked eye, and it is dangerous to put one's nose close to the nest. The Grassgreen Ants—the Queens and workers are emerald green, while the males are black—are like their ancestors and cousins, the Wasps, very wary, numerous and aggressive, and can make it very unpleasant for human noses and eyes.

The Spinners, like most Tree Ants, keep cattle and build silken stalls for these cattle while they are building the silken city for themselves. They frequently build, on the trees which they inhabit, as many as a dozen of these stalls, of leaves woven together with their silk, which serve as pastures for their cattle.

* * *

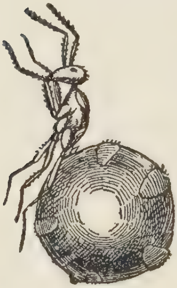
Among some Moorish tribes of North Africa, the fattest woman is considered the most beautiful. When a maiden of good family grows up and is about to marry—at about twelve years of age—she is made as beautiful as possible for the wedding. To this end she is shut up in a small room, which is kept dark almost all the time, and there she is fed up for several months. The result is inevitable: the stuffing and lack of movement transforms the slender maiden into a true miracle of Moorish beauty, admired by all at the wedding. Some Ant-races have similarly coddled maidens; who have not been fed up with a view to beauty, however, but for the sole reason that has weight among all Ant Peoples—to serve the state.

A person may serve the state in many different ways. We humans deem it a heroic deed when a person gives up his life for his people, but what is this sacrifice compared with the similar sacrifice known to the Ants: of those who live all their lives in a dark cellar, hanging to its roof, to serve as living mead-casks for the pleasure of the people? This kind of self-sacrificing martyrdom the people of the Honey Ants demand of many citizens as a matter of course.

The Honey Ants belong, with the exception of a species of the Long-necked family, to the Hump-backed Ants. They are found in Australia, South Africa, North America and especially in very dry districts. The long drought compels the large communities of these Ants to make careful provision for preserving their existence; that is, in the comparatively short period in which food is abundant, to store up sufficient for the lean months which are to follow.

We have learned how the Nursing Ants of Luzon, Borneo, Sumatra have mastered the art of storing up honey-dew in their swollen breast-glands. The Honey Ants proceed in much the same way; but they keep the honey-dew in the crop-stomach—the community stomach—instead of storing it in the breast-glands.

Almost all Ants feed one another mouth to mouth from this crop, one appealing to the other by gentle stroking with the feelers. Those Ants which gather honey-dew, nectar and other sweet exudates from the plants, naturally feel the desire to gather as much as possible; thus they put into their crops as much as they can. The crop-stomach in this way swells up the entire body: the greater the capacity of absorption of this community stomach, the more honey can the single Ant take home with it. All other organs are dwarfed, in this process, the crop-stomach taking up almost all of the hinder body.



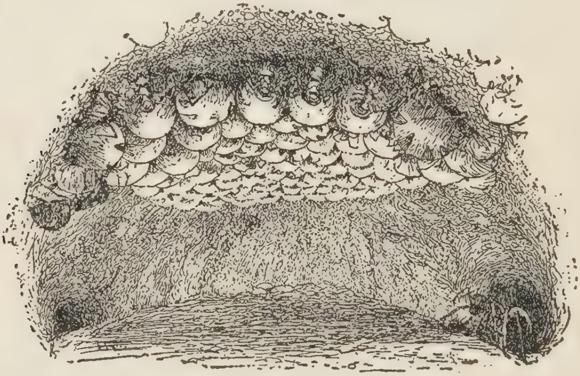
Worker of
Honey Ants

In this way we may observe in some species of Ants that single creatures, that find a good feeding-place fill themselves to the bursting-point, so that these walking honey-sacks can only waver back and forth, moving very slowly. When they reach home, they feed freely all whom they meet, and are soon as thin and lively as before. In a short time the way is cleared to the evolution of a secondary step, the honey-casks that hang in the cellar all their lives.

The division of labor, which plays so great a part everywhere in Antdom, seems to be able to develop special faculties in similar creatures, producing special types for each class of endeavor. In the Honey Ants at first every Ant had the faculty of swelling the crop-stomach. Special workers, which went out in search of food, developed the power of expansion to a higher degree than the others who remained in the nest attending to the housework. The more the capacity for absorption developed, the more was this limited to special individuals, and the nearer did this race approach the point where they had workers which no longer even went out for food, never left the nest, but were filled by the food-gatherers in the nest, and refilled constantly, that they might keep the food and dispense it to all the people as needed.

The links in this evolution are to be found in Natal and New Guinea. The body of the honey-cask of these Ants is quite swollen, yet they are still able to leave the nest and crawl about. The Honey Ants of North America and Australia can not move at all on account of the enormous balloon stomachs which they have developed.

The larvæ of the Honey-cask Ants are not distinguishable from one another, save in size; even the young, barely hatched workers, differ in size alone. It is true, indeed, that the majority of the Honey-casks belong to the larger order of workers, yet we do find many of medium size and some quite small. The large ones could not survive without the others to help. How it came about all at once that individual workers were altered into Honey-casks, we do not know, yet it is certain that the choice of this self-sacrificing office is made from earliest infancy. A number of the newly hatched workers manifest by their extraordinary power of food consumption the tendency to devote themselves to becoming casks, and at once they are fed more and more; fattened like the Moorish brides. Then one after the other is led into the honey cellar, and these they hang to the roof side by side with many others already there.



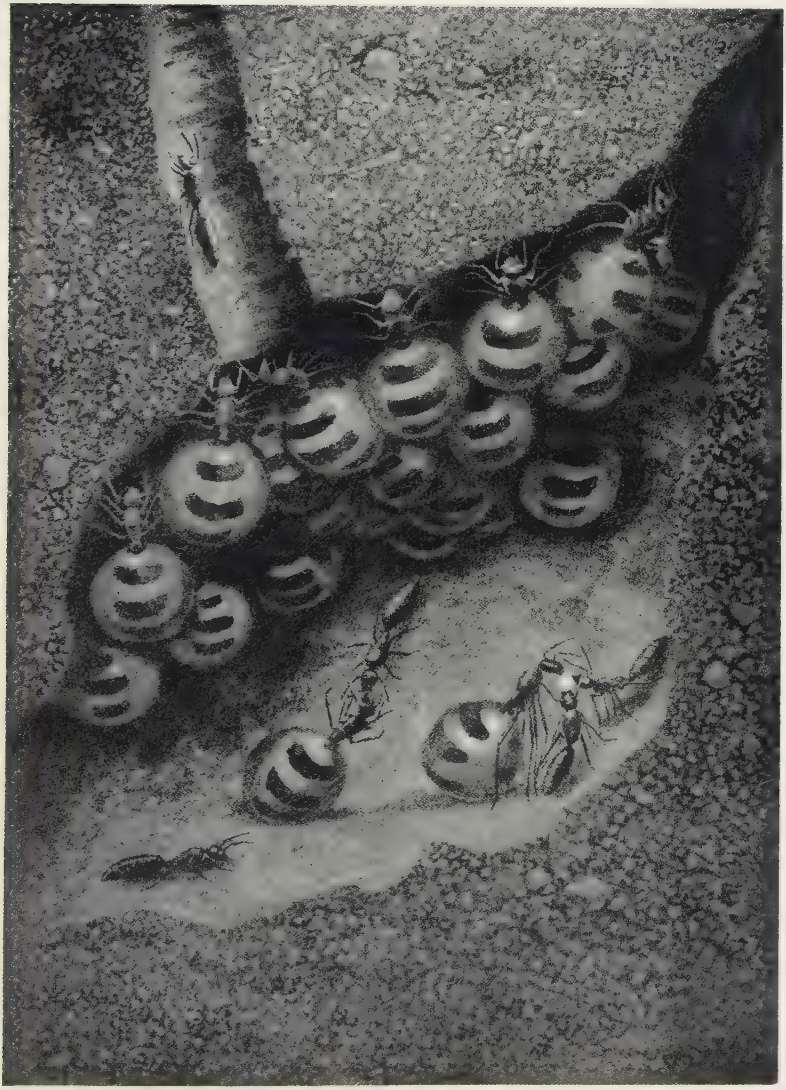
Honey-Cask Ants Hanging to the Ceiling (*Wheeler*)

From that very hour, all their lives long, they are Honey-casks, and nothing else. From time to time they let a few drops pass from the community-stomach into their private stomach, but only enough to keep them alive. The opening and closing of the passage between the two stomachs is controlled by them, just like the opening and closing of the spigot, for that is the only correct name for their mouths. They have no other business than the continuous uninterrupted clinging to the roof with their feet, which have now become mere hooks, so as to carry the weight of the heavy casks. It is a tremendous strain upon their muscles, one which we humans can hardly conceive. During the lean months of the year, every Ant who wants to eat goes into the cellar to the first cask it reaches. The cask opens its spigot; the Ant drinks what it wants; the spigot closes. During the brief period of filling the cask the process is reversed. The honey-gatherers bring the sweet liquid home in their crops and pour it into the willingly opened bung-hole in the living casks.

Every cooper knows that he must keep his casks clean and in good order, and living casks require especially good care. The arched cellar lies from a third to a full yard under ground, in an especially dry place. At the highest point it is about an inch-and-a-third high, some three inches wide and five inches long. The roof is rough, so that the living casks can cling better.

These cellars, like the casks, must be kept dry, because mold may gather on the walls of the cellars as well as on the living casks. Small Ants serve as cellarers, being charged especially with keeping all absolutely clean. It is because of this need for absolute cleanliness that these living casks cling to the roof, rather than resting comfortably on their stomachs on the ground, like all other casks. The Ant-casks must feed themselves and some offal passes. If they were on the ground, lying close together it would be very difficult, almost impossible, to preserve the necessary cleanliness. Being themselves absolutely helpless, it would be impossible for them to raise the gigantic balloon-body, so that the cleaning Ants could cleanse the under sides of their bodies and the ground on which they lay. Mold would form and various diseases certainly would ensue from the accumulated filth. Thus the welfare of the state requires the Cask-ants not only, as life-prisoners, to serve as honey-casks, but in addition to hang from the roof, supporting this great weight by continuous effort, hour after hour, week after week, year after year.

Could any one do more to serve his people than is done by these Ants? It sometimes happens that one of these casks falls from the roof, if the overstrained hooks can no longer hold it up. It is impossible for the Ant to resume its place. The Coopers then come, and raise it up, fastening its hooks to the ceiling. Sometimes, when one of the casks falls down, all does not go so well. At times it bursts, because the balloon stomach has been filled too full. Sometimes it bursts while hanging to the roof. Then the entire swarm of Ants comes running, and laps up the sweet drink as it flows from the wide gap in the cask-creature. This looks much worse than it really is. A friend of mine in Colorado Springs, who kept some Honey Ants from the "Garden of the Gods," in an artificial nest, informs me, that under the care of its sisters, the



Ants Hanging as Honey-Casks to the Roof of the Cellar, "Garden of the Gods."

burst honey-cask soon becomes well again, and resumes its activity as before.

The attitude of the Honey People when one of their living casks dies is quite different. The Coopers loosen it carefully from the roof, but not one dreams of opening the cask and taking the honey, although it is still good and edible. As they would find it difficult to remove the entire animal from the nest, the Ants sever the cask from the upper body. The light upper part is easily removed from the nest. The cask is taken very carefully to the door and rolled out from there. Then it is taken to the burial-place, where often a number of these casks lie about.

The honey with which the living casks are filled is collected by their sisters during the brief season of plenty. Only those that work at night can bring anything in during the lean part of the year. They seek eagerly for dwarf-oaks, and extract a few drops of sweet sap from the small gall-apples. They also gather honey-dew from the leaves or milk it from the Leaf-lice. Whoever eats a Honey Ant is eating sweet plant-sap, which, without losing any of its freshness and sweetness has been in two bodies: in a Leaf-house and in an Ant.

The Honey-cask is a great titbit to the Indians of the Mexican mountains as well as to the Australian negroes. All grab for them when they find a nest. They devour them, one after the other with great zest. Large nests have as many as six hundred Honey-casks. I have tasted them in both countries. I am willing to admit that in the interest of science it was altogether superfluous, but out of curiosity I wanted to see how these martyrs tasted. If any one who reads this is as curious, let me advise him that the Australian tastes a little sweeter than the Mexican, but the latter is fatter. But . . . I prefer caviar! As far as taste is concerned the Honey-casks are the best of all the Ants. If you taste one of our House Ants, that are so fond of our sugar, and it may easily happen that you get one into your mouth by accident, it will be hours before you can rid your tongue of the unpleasant flavor.

The Mexican Indians, who make whisky out of everything that will ferment, naturally make a kind of brandy out of the Honey-casks, of which they are extremely fond. As compared with pulque, which they make out of the maguey plant, they hold this in higher esteem, and it is certainly better than bay rum, witch hazel and other toilet waters which we managed to get while in American detention camps. The honey from the living cask seems to be very good, even for medical purposes. One of the Mozos who had bruised his arm rubbed the swollen place with some of this honey and the swelling subsided very soon thereafter.

CHAPTER VII

GROWING FOOD

If we were to believe the books of natural science, we might be led to think that Ants are the dullest and stupidest of creatures. The desire for knowledge aroused by Brehm would be utterly smothered if we listened to the scientific pedants describing Nature as they see it—but old J. Henri Fabre was of a different genius.

I shall never forget the day that I visited him in his garden home at Serignan in the Vaucluse. I had gone there from Orange with Marie Laurencin, the painter. It was a broiling August day. A yellow kitten lay in the hedge, barely a week old, cast aside, hungry, hardly able to whimper. Marie took it up, carrying it in her handkerchief. Her first request of the old man was for some milk for the kitten.

The octogenarian was seated in a rolling-chair. Dressed all in black, the broad shirt-collar falling snow-white over his shoulders; freshly shaven, possibly in our honor—the powder was still on his face—he looked like an old, dying Pierrot. His eyes were very dark and extremely large—welcoming eyes; brilliant eyes; eyes which had looked deeply into Nature for a long lifetime. Bright indeed, but a little tired. That man knew: "Now I must soon depart. A few months more, perhaps a year—a year in the rolling-chair, for work is no longer possible. Now, I shall have to go very soon, and there is so much to see everywhere in God's Nature; infinitely more to be seen."

The old wizard took our kitten on his knee. He had milk brought, lukewarm, mixed with water. He knew all about animals, even hungry little kittens. He was indeed a great wise man, old Fabre. Exact science ignored him. The Academy of Sciences of Paris had never awarded him a prize of forty thousand francs. Nay, when in 1913 they had six seats to fill, they elected six nonentities, ignoring this man who had borne the fame of French science all over the earth. Because Fabre's methods were not in accord with "exact science," and because he was too literary; which means, because he wrote so as to be understood, which the pedants never do. That the wine-growing peasants of Vaucluse considered the sage a poor fool, because they saw him lying on the ground studying insects day after day, is understandable; that the field-watchers considered him a tramp, is no less comprehensible; but that the Paris Academy refused to elect the greatest sage in their country, because he was an artist and not "learned," let him who can, understand. He worked for half a century for science. No less a personage than Darwin welcomed his splendid original contributions to real knowledge. They have erected three monuments in his honor. All the world rings with his fame. Yet ten years ago Paris ignored him, because he was a writer.

In similar fashion in Germany the pedants ignore the work of wonderful old Brehm. Brehm wrote German beautifully and "scientists" hated him for that, because they can only stammer in a special incomprehensible jargon. They charge him with seeing animals anthropomorphically—as human! And the pedants shake their snuffy noses and call him a "dilettante popularizer." They did not rest until in the latest edition of his work, they "unpopularized" it, by taking all of the life out of it. No more stories, no more legends in natural history! Fortunately not every naturalist is a pedant, glued to exact facts. If one of them becomes possessed by a thought, he dares to utter it at any cost, forms a school, and finds a host of adherents, who aid in carrying the work forward. Stories and myths arise far more vivid than those of the "dilettante popularizers"—the artists and poets.

Scientists of this type appear among the zoölogists who write thick books about the marvels of "mimicry," and the botanists who have much to tell us of the relations existing between plants and Ants. It is most enchanting reading, and I wish that all of it were true. Unfortunately we have only to travel about a bit and use both eyes to see that much of it is purely imaginary. That Ants do utilize certain plants is true. That Ants are of a certain value to some plants is no less true. That they render service to these plants in return for what they get, that a certain contract, so to say, exists between the Ants and the plants, a fixed *quid pro quo,* is all utter humbug.

It may be stated, as a general rule, that Ants benefit plants more than they harm them, and that Ants do make considerable use of the plant world. They get much of their food supply from the vegetable world: seeds of all kinds, honey and fruits. Further, they find many opportunities for building their nests on tree-trunks, under the bark, in all kinds of hollows, on the branches and twigs, thorns and galls. They also utilize blades of grass, parts of the roots, bulbs, knots, hulls of fruits. The leaves serve not only for building their nests, but also as a pasture ground for their cattle; they use them also as the basis for their mushroom gardens.

In all these cases the Ant People utilize the plant world, and the plants receive no inconsiderable aid from the Ants, but the gain is always one-sided. A mutual relationship does not exist, we can not speak of it as "give and take." The botanists filled with wild phantasies have indeed written a thousand and one tales about the "Ant-loving" plants. There are plants, they say, that hold the Ants by some special attraction. These plants purpose in this way, they say, to have the Ants protect them from all their enemies. Some plants go as far, they hold, as to develop special lures for the Ants, not possessed by them before, so as to catch and hold them. These plants would then have to adapt themselves so perfectly, in order to hold the protecting Ants, as to develop a triple quality: they must give the Ants a good place in which to live, or good nourishment, or develop some other fascination by which they are held.

As to the last suggestion, we are told that some plants have colored the parts which hold the sweet liquids very strikingly, snow-white or purple-red. But every student knows that Ants are affected less by vision than by smell and touch. I have proved by many experiments that all colors are alike to Ants. Whether the drops of honey are yellow, red, green or black matters not a whit. There is nothing whatever in this lure theory.

There are innumerable trees in the tropical forests which offer splendid places for nests in their hollows, branches or thorns, and many have places from which the Ants extract sweet, honey-like fluids. Besides these nectars, which are as much liked by Ants, and other insects, as flowers are by Bees, some trees have on the ends of their leaves or on the leaf-stalks peculiar titbits, the so-called "Muellerian" and "Beltian" bodies and the "Pearl Drops," which are gathered by the Tree Ants, but are then reproduced in large quantity by the trees. It is no wonder that these trees, which offer home and food as well, are eagerly inhabited by Tree Ants. As a matter of fact they are especially chosen by the Azteca species. The Azteca Ants are very warlike, very courageous and well armed. They attack every enemy at once, even though it try to be friendly, considering the tree as their own. Hence comes that famous adaptation of the "Ant-loving" plants. The Imbauba tree offers the Azteca splendid homes and at the same time delicious food, and has developed both of these, so as to enjoy the protection of these ants!

* * *

The Imbauba (the Trumpet) tree is found all through the Brazilian forests. The leaf-cutting Ants are also generally found, stripping entire trees of their foliage, but the Imbauba, which is inhabited by the warlike Azteca, escapes attack. The Trumpet tree has a hollow trunk as well as hollow branches. The hollow is not large, but there are many hollows separated from one another by thin walls at the knots. A leaf shoots out from each knot; and on the stem of the leaf is a kind of hairy cushion, on which the yellow Muellerian bodies grow. The trunk as well as the limbs have, besides these knots, a slight depression, which is quite thin, almost like a small hole. It is bored by the young Ant Queen who comes here after the hymeneal flight. While other young Queens dig deep into the earth and make a hollow there, only to seal it tightly, and lay their eggs there for months while they go hungry, as they raise their first brood; the fortunate Azteca Queen has nothing more to do than to bore this hole, by biting through the thin place at the stem of a leaf of the Trumpet tree, and take refuge there. In the space between two knots she finds a beautiful ready-made nest. She does not even have to seal up the opening, for the Imbauba does that for her, as it grows together over the spot. Even in this growing material the young Queen finds satisfying nourishment. The fine tree protects her also from any mishap during her young motherhood.

When the young brood has matured, it makes holes in the walls between one hollow and the other, and at the same time makes openings in the places which have grown together, letting it out into the world. In this way, the walls being pierced, all the hollows are connected. There is one long passageway down to the earth. The people, now become very numerous, build a paper nest down below in the trunk, and make an opening through which, and the small doors at the twigs, the Ants can go in and out easily. Now they gather the Muellerian bodies and store them in large storerooms in their paper nest. They have become so much accustomed to this food that they will hardly touch any other.

No plant could offer more than this to the Ants. It is therefore easily conceivable that any Azteca people which considers a given Imbauba tree its residence would defend it against all comers. In fact it is often the seat of very savage conflicts. Not one, but half a dozen young Azteca Queens may have selected the same tree as a home for their future people. Each one has bored a hole under some twig, between two knots, to found her nest, so that later we find, not one, but an entire series of young peoples on a single Trumpet tree. But each one desires the entire tree for itself. At once a fight to the death takes place between all these peoples. The battle ends with the annihilation of all the other peoples and Queens, so that finally only one people and one Queen, with unlimited rule over the tree-realm, remains to live at peace in rich superfluity of food. Thus so long as that Trumpet tree stands all is well; if it falls, is uprooted by a storm, or struck by lightning, the people that lived in this tree perishes with it.

Thus far it is true: for weal or woe the Azteca and the Imbauba hang together; up to this point the observations of students agree. But everything is in favor of the Ants. That beautiful thought of the "Ant-loving trees" still requires two elements: that it be true that the Trumpet tree has developed one or all of the features which are most useful to the Ants—the Muellerian bodies, the hollows, the thin spots, through which the Queen makes her way—for the purpose of attracting the Ants and holding them for her defense; and second, that the Azteca really do offer this defense.

As far as the first question goes, the adaptation of the tree can not be proved. The investigators are merely presenting beautiful thoughts, fantastic, alluring suggestions and conclusions, all hanging in the air. It should be very easy to prove the second point, that the Ants protect their trees from injurious attack—if there were such a thing!

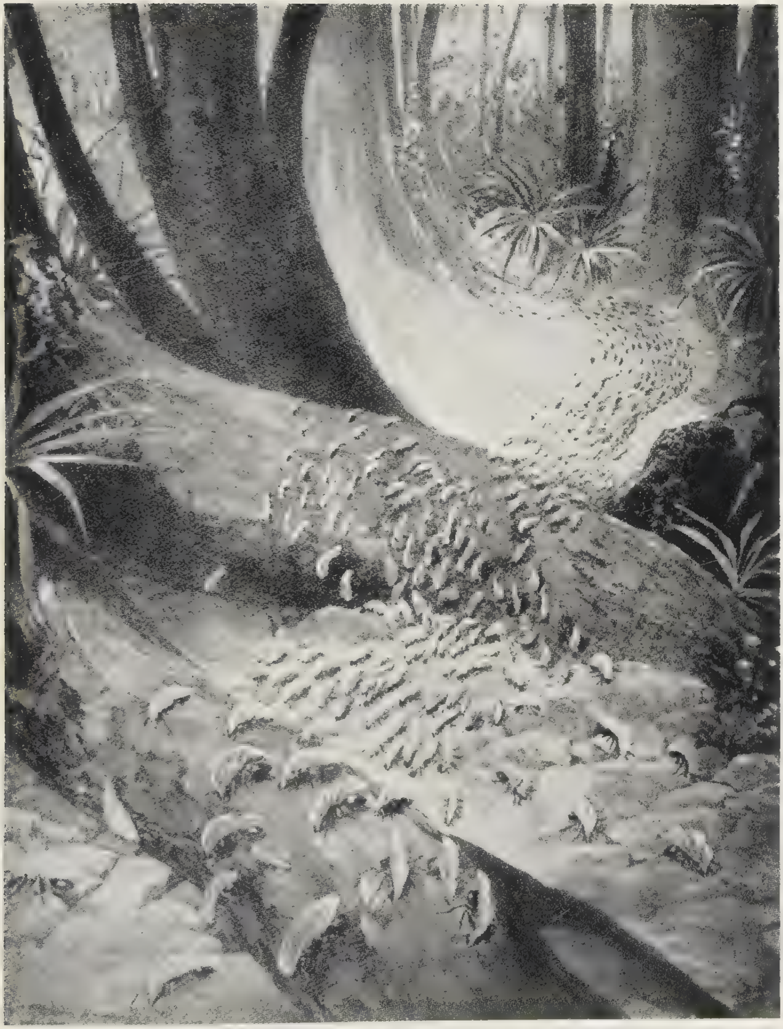
But, it is not true. The Ants never think of offering any protection to the Trumpet tree. They drive out by savage warfare all other Azteca Peoples, but that helps none save themselves, and certainly not the Imbauba, which grows its titbits and has its hollows for all alike.

The idea of some scientists that the Aztecas protect the tree from the attacks of the Leaf-cutting Ants, which as far as they are concerned value the leaves of the Imbauba highly, is fallacious. Every Imbauba tree, they say, is inhabited by some Azteca people, therefore the Leaf-cutters avoid these trees, as they have a deep respect for the weapons of the warlike householders. This is untrue! I have seen many Imbaubas in which no Azteca People lived; nevertheless the Leaf-cutters did not visit these trees, to clip their leaves. These Ants do not care at all for the leaves of the Trumpet tree, so any protection of them is meaningless. In addition, although the Azteca do attack their own relatives, and some insects which happen to come to the trees, they permit other insects to live upon their trees. Among these are some insects which feed upon its leaves, such as the Lazy Beetles, the Leaf-beetle larvæ, and some Wasps. Especially in Paraguay, I saw many Trumpet trees inhabited by Azteca, the leaves of which were eaten up by all kinds of insects. It did not seem that the very healthy trees were greatly injured, nor did the savage Azteca seem to think of driving away the feasters. They defended their nests, defended the hairy cushions on the stems of the leaves, on which their food grew, but it never occurred to them to drive away from the leaves the destructive insects, as they themselves were not interested in the leaves. If then the Imbauba has no special enemies, and if, in addition it is not protected from them by these Ants, of what value to them are these crawling Ant People?

All that is needed now to make absolutely ridiculous the scientific teaching of the "ant-loving Trumpet tree" would be proof that the Azteca not only do not help their home-tree, but that they really hurt it—and that is what they do! Woodpeckers, which feed upon these Ants, dig deep and numerous holes into the tree, so that its power of resistance to the heavy tropical storms is greatly weakened. Here goes that beautiful soap-bubble of the "Ant-loving Trumpet tree."

* * *

I have dealt with this question of the Imbauba and the Azteca which live in it quite at length be-



Leaf-Cutting Ants Bearing Leaves to Their Nest, in Endless Procession.

cause this story has long been the classic instance of the most intimate exchange between Ants and plants. Many other tales of students about the Ant-love of plants rest upon still flimsier foundations. So it is with that tale of the flute acacia and its hollow thorns inhabited by the Hanging-stomach (Cremastogaster) Ants. The swelling of these thorns of the acacia does not occur because the tree is desirous of housing and feeding the Ants, but probably on account of a disease brought about by certain bacteria. Only a few of the thorns swell up, while most of them remain normal in size. Moreover the Ants give just as little protection to the acacia, as the Azteca do to the Trumpet tree; the thorns themselves are a far better protection from browsing cattle. Of course the Hanging-stomach Ants fight fiercely when attacked; at least the triple-colored Hanging-stomach Ants which build their nests in the galls of the East African flute-acacia have developed a special tactical defense when attacked. They stand in a crowd about the small door of their little nest, but with the hinder part of their body outward! Then from each hinder body comes a white drop of liquid with so vile an odor that the enemy withdraws, leaving this unappetizing colony in peace. In this way they repulse the savage attacks of the Wandering Ants. But these enemies would not do the least harm to the acacias; they have no taste for the tricks of the Hanging-stomachs.

The chapter on the relation of Ants and plants contains another story much more wonderful than that of the Azteca and the Trumpet tree and the Hanging-stomachs and the flute-acacia. It is the story of the Mushroom Growers. These Ants belong to the Knotted Ant family, bearing the name "Atta," which means "Old Man." It was the pet name given the old man by the young Greeks. These Ants have something of the leisurely, dignified and legal in their motions—not really manly, but rather matronly, poised. This is especially notable when they march in long lines, armed with their umbrellas.

The Ants of the Atta race inhabit the American tropics, and are also found to some extent in subtropical lands. We also have in Germany an Ant, the small Soot-haired Garden Ant, which also understands how to grow fungi. These Ants build a pasteboard nest and tapestry its walls with fungi. The fungi serve as mortar, aiding in making the walls solid. It is peculiar, a marked parallel to the American Fungus Growers, with which the German Garden Ants are not related, that this fungus does not occur outside of the nest, but seems to be the unique product of these Ants. The German Fungus Growers resemble the Indian Ants in another respect: both are covered with a thick hairy growth. That there is any relation between this hairiness and the production of fungus is not proved.

The Atta Fungus Growers are harmless creatures. Their sting is slightly developed, but they fight well with their sharp upper jaws. Some species refuse to fight altogether, are most timid, and pretend to be dead when danger threatens. The workers are of many sizes, ranging from tiny mites to tall soldiers. Some species show as many as sixteen different types.

The various species differ from one another greatly in their methods of growing fungi. Some gather the offal of Wasps, to make the bed for their fungi; others utilize fragments of vegetable growths, petals of flowers or rotted wood, while the most highly developed Leaf-cutters use fresh leaves for the bed. Some live in very small communities of hardly a dozen souls, while others have a huge population in the nest. There are dwarf nests for one species, gigantic nests for others. Some build hanging mushroom gardens; others lay them on the soil of their hothouses. Even the mushrooms appear to differ considerably with the species of the producers, but none refuses to eat what the others have grown.

Every one who has traveled through the American primeval forests has seen the Leaf-cutters. The Indians of Brazil call them Saüba. They travel in long lines over the ground, each one bearing a parasol, which they have cut out of a leaf, usually twice the size of the Ant. It looks as if they were sailing along, or as if they were protecting themselves from the rays of the sun. They climb the trees and bushes, clip out the piece of the leaf they desire, and take it to their nest. They may be watched easily, as they strip a bush with their sharp shears, never seeming to hasten as they labor.

When a young Queen flies out into the world, to take her part in the joys of wedlock, and found a people, she is strong, well and fully nourished. She takes no baggage with her and no provisions for the journey, but she has her food. The fungus is sacred to these Ants; around it all the life of the Queen centers. How she finds it we do not know—some heroine of her people must have discovered it, as Prometheus snatched the fire from heaven.

This young Queen carries in a pocket of her mouth a little of this mushroom spawn on her hymeneal flight. She finds her beloved and is wedded. As soon as she feels that she is to become a mother, she digs into the earth, hollows out a small chamber and closes it up from the eyes of the world. Her work is harder than that of all other Ant Queens, and much greater than that of the neighboring Azteca Queen, who receives a home and nourishment from the Trumpet tree, having only to lay her eggs, and care for the hatching of her brood. The Queen of the Leaf-cutters, however, has to build her home with great care, looking after her own food supply, for her most strenuous effort produces only a limited quantity. She has to rear her young and prepare the mushroom garden for the future people of which she can enjoy only a little. She is not only Mother and Queen, but also the foster-mother of her people.

Hardly has she immured herself in her dark home, withdrawing into the earth, when she spits out the heritage of her mother; that all important mushroom spawn. Now follows a couple of days' rest, during which the mushroom-spawn grows very rapidly. On the third day the egg-laying begins, and at the same time the continuous care of the growing mushroom garden. It must be fertilized, and that so carefully that the smallest bit of spawn receives the greatest possible food value. This fertilizer also the young queen has brought with her. It comes from within herself.

The Chinese living in large cities are intensely fond of flowers, cultivating them, and rearing them with greater care than any other people in the world. Fertilizer in the great cities is hard to secure, so they are most careful to gather what they can at home and from their friends. But even the Chinese can not give the care and patience bestowed by the Queen of the Atta Ants. She bestows her largess upon each particle of spawn with meticulous care, pressing all into place.

But now, if the gardener is to do her work well, she too must have nourishment. The Queen dare not eat any of the mushrooms in that garden, for they must grow large and full to feed her coming children. There is nothing else to eat in the narrow chamber. The Queen takes counsel with herself. She has her food within herself. After the third day of her imprisonment she lays approximately ten eggs each day, and she eats most of these. In this way she keeps herself alive and retains the strength to tend her mushroom garden. The Queen gets very little rest, for besides tending her garden she has to smooth her room, keep herself clean, and rear her brood, which she lays in the midst of her mushroom garden. As soon as the larvæ are hatched from the eggs their mother feeds them, as she does herself, with mashed eggs (scrambled eggs), nine of the ten which she lays daily being consumed in this way.

When the first young Ants emerge from their pupæ—they are dwarfs, the smallest of workers—the mushroom garden, which the Queen Mother had planted, has grown from a small fraction of an inch to an inch in diameter. The little daughters begin to help their mother with her work at once. They take over the feeding and cleansing of the young brood, which is still fed with the eggs of their mother, while the little Ants begin to feed on the mushrooms from the garden. They also help their mother in the fertilizing of the garden. The Queen Mother superintends the work, and still helps.

About a week after the young Ants have made their way out of the pupæ, they begin to dig, and after a few days have made an exit to the surface. Now the real work of the young people begins. While the Queen leaves all the labor to her daughters she does nothing else than lay eggs, the young Ants progressing day by day in their work in the outer world. They climb reeds and bushes, cutting off leaves, and sail back to the nest with them. The pieces of leaves are cut into small bits, and kneaded into balls. Henceforward they serve as fertilizer for the ever expanding mushroom garden, the other fertilizer being no longer used. At the same time all cannibalism stops. Not only do the ants feed upon the mushrooms, but the larvæ are fed with them. Apparently this food is far more nourishing than the eggs, for now we get workers much larger than the first dwarfs, some of them six times as large, and some males and females which are still larger.

New mushroom gardens are added to the first, and more subterranean hothouses are built. The size of the city grows with the number of inhabitants, increasing enormously. One of these hothouses—a chamber in the earth for growing the mushrooms—may be extended to twenty inches, and a foot high and broad. Some investigators report mushroom gardens a yard high and six yards in diameter. The passages lead as deep as seventeen feet into the earth; the doorways are made wide, so as to allow for circulation of air, as in the case of the Honey Ants. The many flues built over the city have a diameter of a yard. The entire nest may cover a space of a hundred square yards. Each one of the innumerable chambers has a spongelike mushroom garden in which the eggs and larvæ lie soft.

The division of labor is now strictly enforced. The medium-sized workers must cut leaves and bring them to the nest, while the very large ones serve as Soldiers and guards at the doors. Smaller Ants knead the bits of leaves into balls and build up the new mushroom gardens, taking the fresh leaf-mass into the old gardens, removing the old, and taking it to the garbage-heap. The smallest Ants take care of the Queen and the brood.

The smallest dwarfs have very important work to do. They are the real gardeners. They take out all weeds, especially other kinds of mushrooms that spring up in the hothouses, for only the snow-white mushrooms should appear on that brown leaf-bed. Even this fungus must not grow at will, but only as the Ants desire. If let alone this fungus would grow long stems, real mushrooms, as high as five inches. But the Ants do not want this. The small Ants bite off the budding stems daily and hourly; in this way they develop small round or oval expansions. The German discoverers who first found these called them Kohlrabi—rape-cole.

This "rape-cole" which hangs all over the white mushroom garden like clear drops of water serves all this Ant People for food. The mushrooms—rather the various mushrooms, for the different species of the Atta grow different varieties of mushrooms—are exclusively Ant products. The mushrooms that we find in these gardens do not exist outside of them—just as men have developed vegetables and flowers which never appear in uncultivated wilds.

* * *

The peoples of the Mushroom Growers wax many and mighty; they are really the lords of the American tropical forest. Numerous as the dangers to the individual Ant may be, just as few are they to the whole people. Even man, whose feelings are hurt because these Ants seem to prefer the leaves of his shade-trees, can do them little harm. I have seen them smoke out nests often. They dig a hole seven feet deep in the ground, place lighted dry brush in it and sulphur all over it. They cover the hole with an iron plate, and blow the fire with a strong bellows. Many yards away the Porter Ants will be seen, coming out of the nest taking the brood to safety. This method of destruction is tiresome, expensive and by no means sure. If the Queen lies very deep, the smoke does not reach her, and all the labor is in vain. For this reason many farmers dig down into the nest until they find the Queen. This is a very troublesome task, and the result is not absolutely certain either. The people of the

Porter Ants accept young fructified Queens, if the old one dies or loses her power of generation, and the people is revivified.

It seems as if the powers of Nature are just as helpless as man against the gigantic hosts of the Mushroom Ants. If lightning strikes the largest trees, sets fire to the trunks, and a mighty fire spreads through the forest, the Atta Ants are quite safe in their nests, deep down in the earth. They have enough provision in their gardens to last during the lean season, until the leaves are green on the trees again. In the interval they can gather the fertilizer from other parts of plants. Even great floods do not annihilate their people. If there be a large community of Ants, they roll themselves into a huge ball, with the Queen and the brood in the center—not forgetting the holy mushroom spawn. In this way the people floats on the water and erects a new city on any ground it reaches.

CHAPTER VIII

THE CATTLE-KEEPING ANTS

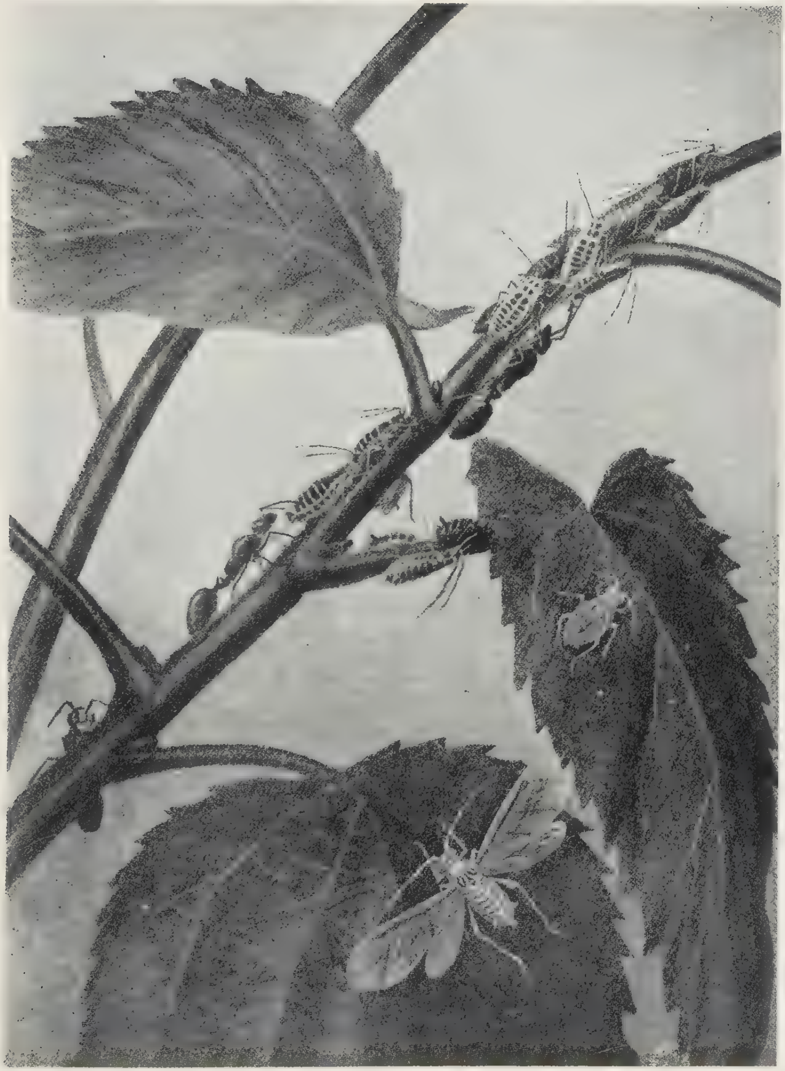
When in very ancient times early races of mankind passed from living in the forest to cattle-keeping, it was because they had found out that some animals were more useful to them alive than dead. We can do nothing more with a dead animal than eat its flesh, but a living animal that gives milk may be milked daily and finally eaten. The Ants passed through a similar experience.

The peoples which eat nothing but meat, the Hunters, know nothing about cattle-keeping. These, among our insects, are the Stinging Ants and the Wandering Ants. Among all other races we find cattle-keeping more or less highly developed—all over the earth, as is the case with men. We humans get the sweet liquid from Cows and Goats, from Sheep and Asses, from Reindeer and Camels. The Ants know no smaller a number of creatures adapted to being milked by them. As the Cow is our favorite, so is the Leaf-louse to them. They also have Leaf-fleas, Crickets, Blue Wasp-grubs, Lightning-bugs.

What the Ants milk from their cattle is not exactly milk. It is called Honey-dew, or to use the Biblical name, Manna. Pious souls might think of it as the most precious, divine food, no less delicious than nectar and ambrosia. The Leaf-lice, and the other cows used by the Ants, suck the sap from plants with their proboscis; or, as in the case of the Blue-Wasp, devour the young leaves. They eat or drink very much and digest very little, and the sweet liquid becomes sweeter for passing through their bodies. They send it out in small, colorless drops, which fall upon leaves and plants and dry in the air very quickly. This is what the ancients called "Ros melleus"—Honey-dew. They believed, like the Israelites in the Wilderness, that it had fallen from heaven.

Israel had left Egypt only a few weeks before; it was encamped in the Wilderness between Elim and Sinai. Provisions were exhausted; the people sighed for the fleshpots of Egypt and murmured loudly. Then God sent Quails and Manna. This Manna looked like "Coriander seed, white; and the taste of it was like wafers made with honey. When the sun was hot it melted."

It is true that while the Jews were in Egypt they did not get out into the open very often. Otherwise the Honey-dew would not have been so unknown to them that they asked one another: "Man hu? What is that?", giving the sweet food a name in this way. Many other nations had known Honey-dew for a long time and prized it as a titbit; and all of them, like the Jews, took it for granted that it was dew from heaven, and no one,



The Aphides (Plant Lice) of the Dairying Ants.
The Ants are shown Milking these "Ant Cows."

up to our day, really explained its origin. The Plant-louse which provides the Manna (*mannifera*) of Sinai lives upon the tamarisks, and deposits its Honey-dew, just as the Bible says, not only upon the leaves, but also upon the ground. Even to-day the Arabs gather this food and call it Manna, the name that was used in the time of Moses. The monks of the monastery on Sinai sell Biblical Manna, and it is sold as Manna all over Persia.

The beautiful dream that the Manna fell from heaven rested chiefly upon the powerful support of Biblical authority, rather than upon Arabic, Greek or Roman legend. Réaumur, who made the thermometer, discovered, less than two centuries ago, that this delicious dew came not from heaven, but from a small green Louse.

Does Manna taste any worse now that we know whence it comes? The children who gather it, when they can, care little about its source, nor have grown-ups any prejudice against it, for they eat much filthier things. The food of the Plant-louse is the cleanest possible—the juice of plants.

Many tree-insects produce Manna in large quantities. When we see what value is attached to it on the peninsula of Lebanon, we are tempted to accept the general purport of the sixteenth chapter of Exodus as true. There it is said that every one should gather as much Manna as he desires each day. Some gathered more than they needed and kept it over night; then the Manna stank and worms issued from it. Quite true—spores of fungi do cling to the Honey-dew and grow out of it, and melted dew is the result.

The Australian producers of Manna, the Leaf-fleas, are esteemed by all the natives as well as by the children of the whites as "Sugar-plums." A man can gather three pounds of Manna in a day, certainly more than he can eat—for a person may have too much even of Manna. It was most wise that God sent Quails also to the people of Israel—food which I prefer to the best Manna.

The Ants are fond of anything sweet, and are lured by it. Their prehistoric ancestresses of the earliest ages, wild hunters as they were, tasted these sweet drops from the Plant-lice, and esteemed them highly. Then the Ants found the Honey-dew, which tasted far better than the Plant-lice. They understood, many million years before man knew it, what this Honey-dew really was; and they saw that it was far more convenient to lick up the flowing sweet liquid than to knock off the hardened sweet food. In this way they attained the thought of gathering Manna at the source, from the Manna-distributing animal itself.

This idea was much more brilliant than that of Man when he began to milk Cows and Goats. The human mother nurses her child like all other mammals—the drama was played daily. What was so good for the child, for the calf and the kid—what made them strong and hearty—should be good for grown persons; therefore mankind began to milk cattle. Of course they began first by using the mouth; only later did Man learn how to use the hands and a milk pail. Man saw what was going on in Nature, and did nothing more than imitate.

Pasture Ground of Ant Cattle (*Mordwilko*)

But the Ants saw nothing like their method; imitated no one. Their discovery that it is possible to milk Lice originated in their own brains. The Leaf-lice, like all the other Ant cattle, are gentle and amenable creatures, so kindly and friendly in disposition as to be comparable with our gentlest cows. They live in herds, eat voraciously, and therefore produce a tremendous quantity of sweet liquid—in short they perform the function required of them by the Ants. It seems, even, as if they enjoy the attentions bestowed upon them by the Ants, just as the cows seem to feel relieved when the milk has been drawn from them.

How the Ants milk their cattle may be observed by any one. Leaf-lice are to be found everywhere, and wherever they are Ants are not lacking. The Louse sits on the leaf, very solidly, its sucking-trunk being fastened deeply into the leaf. The Ant places itself behind the Louse and begins to stroke and tickle its green body with her feelers. Then the Louse bends her head, raises the hinder part of the body and stretches the hind legs up into the air, so as to make the work easy for the milkmaid. Shortly thereafter a clear drop comes from her, which the Ant eagerly laps up. The milkmaid continues stroking the Louse gently, first on the right side, then on the left until the gentle creature lets down a second, even a third drop of Manna. Having milked one dry, the Ant goes to the next Louse, milking them one after the other, until her milkpail is filled to the brim. The milkpail is her communal crop-stomach, which she has learned to expand in such a fashion that her hinder body is swollen tremendously, and she can barely stagger home very slowly.

The Ant cows are not stingy, but give their sweet fluid willingly and richly. If one of them be empty, the milkmaid must wait a while. The Leaf-lice have also learned how to deliver their sweet gift to the Ants. If they do not wish to be milked, they shoot their sweet drops some distance, and at the same time they kick back, like a fretful donkey; if they are milked, they let the drop issue slowly, so that the Ant can lap it up easily. They have also learned to be good, and to wait until the herder comes so that the first drop is very large—more than this: they eat more, and as a result produce a large quantity of Manna, when they are being milked by the Ants than when they are living an uncontrolled life in the open. They may have taught this to themselves, but it seems more probable that their mistresses, the Ants, have brought it about in some way. At any rate it is certain that our Black-haired Garden Ants get much more Manna milk from their cattle than any other Ants do. This is not difficult to determine. The more Manna the Lice give forth, the more sap must they have absorbed, and the more must the plants suffer from this process. No beanstalks suffer more than those upon which the expert milkmaids of the people of the Black-haired Ants keep their herds. The art of milking has to be learned, whether it be the cows used by men or the Lice used by Ants. Darwin was a poor milkmaid. He was the first to try to imitate the Ant in milking the Louse, but he failed. Since his time men have learned how to imitate the tickling of the ant-feelers: and the little green cow gives her milk.

The connection between the two creatures is not limited to this milking, while this is the Ant's sole reason for loving the Plant-louse. If you keep cattle, you must know how to protect them, and that is what the Ants do. Of course the Leaf-lice are not altogether defenseless. On the hinder body they have glands, with outer openings, from which they can spurt a liquid. Linnæus thought that the honey-dew came from these glands. Only later was it proved to come directly from the body of the Louse. The Lice spurt from their glands a gluey, wax-like matter, their only weapon against many foes. This glue being spurted into the enemy's face, where it dries quickly, the attacking insect has hard work to free itself of this encumbrance. But this really does not help the poor Leaf-louse much, for with its trunk deeply sunk into the leaf it can not escape quickly, and in that great murder-cellar, Nature, in which the larger devours the smaller, a new enemy appears, ready to devour.

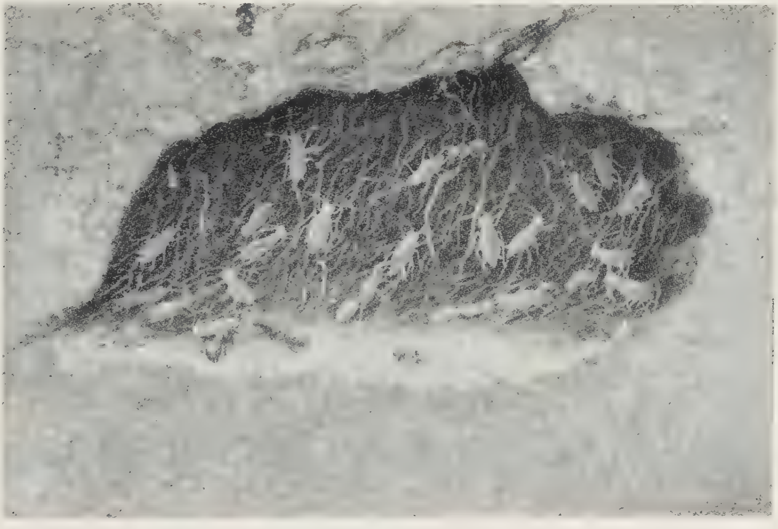
The Lice do not use their spurting glands against the Ants, the best sign that they do not consider them enemies, but are accustomed to them. As a matter of fact, the protection offered by the Ants is far greater than their own means of defense. If the Leaf-louse, an easy prey for every robber looking for this titbit, is attacked, the Ants are transformed at once from quiet herders into savage warriors, who protect their cattle and attack their enemies mercilessly. Every Ant fights with the weapons peculiar to its people: the Red Ants spurt clouds of formic acid upon the robbers; the Blood Red Slave Hunters attack them without hesitation with open saber-jaws. If the danger be a lasting one, the Ants carry their cattle out, which is by no means easy, because the Lice have a strong proboscis, which is often three times as long as themselves, and where they have settled they sink their proboscis deep and suck persistently. In such cases, even in times of peace, when they want to remove from one pasture ground to another and better one, the Ants try to persuade their little green cows by gentle blows of their feelers to let go and allow themselves to be taken away. Usually this serves, but sometimes the green cow is very stubborn and resistant, so that the Ant has to pull and tug until she can at last carry her off.

On our grazing grounds on the Alm, on the fertile meadows of the marshlands, the broad prairies, steppes and pampas, our cattle are sometimes in great danger. It is not so very bad to-day, because an attack by a Vulture, a Bear or a Wolf, or a Wild Dog, which brings terror to the peasants, and takes away a Lamb or a Cow, is in all the papers, but a few hundred years ago the Herdsman and his Dog had to be on guard all the time to protect the herds from beasts of prey. For this reason men invented barns to protect their cattle from beasts and from wind and weather; and the Ants do the very same. Man built his barn very much like his own house. Whoever built a stone house gave a stone barn to his cattle; whoever lived in a country rich in timber, built his house of logs and built in the same way for goats and cattle. The Ants do the same thing, although the matter of building is much more difficult for them. Their cattle do not eat fodder, but consume only the sweet sap of special plants to which they are accustomed. For this reason the Ants must build their barns over the entire herd and the pasture as well.

These barns vary greatly. The Masons build theirs of earth and mortar; the Paper-workers build paper barns; the Spinners in the tropics weave leaves together with their own silk, building barns which may be a half yard long. With some species, covered passages lead to the barns so that the milkmaidens may go to their cows unseen and protected from danger. Of course these barns, as is the case with us, serve not only to protect the cattle from beasts of prey and storms, but also prevent them from running away, and at the same time, prevent their being stolen. A couple of strong cattle-herders may insure the food of an entire people, so it is not remarkable that one people attacks another, and that fierce battles are waged for the possession of this valuable property.

Cattle-keeping is developed to its highest point by some species of Ants which live subterraneously. If milkmaids go out, find Leaf-lice and milk them, build barns over them; that is not yet cattle-raising. That begins only when the young are raised regularly. Here, too, it was far simpler for Man. His Cow calved; he reared the Calf; it gave milk and again calved; thus one generation followed another easily. The Ants have a much harder time with their cattle, inasmuch as at some

Home of the Honey-Cask Ants, "Garden of the Gods," Colorado.



Root Aphides which Live Underground, Attached to the Roots of Plants by the Ants.

period in their lives they become winged and fly into the air. Nevertheless, the Ants know how to rear their cattle systematically.

In the Autumn the eggs of the Plant-lice are gathered and brought into the Ant-nest. There they are cared for just as sedulously as is the Ant brood. When the young have hatched out in Spring, the Ants take them out to the young grass-roots; but in bad weather, or when the nights are cold, they carry the cattle back from the pasture to the warmer nest. So the young Lice are placed on the tender roots. After a few days the Lice begin to lay—they are all females—and the eggs are without male fructification. From these the young creep out very soon, all females again, which are also placed on the tender roots. This new generation also reproduces itself without fertilization, and this process is continuous. In a single summer these Lice may produce a dozen generations of which two-thirds are alive at the same time. When a root is exhausted, the cattle are transferred to the next, and thus from one plant to another.

All these generations are wingless, but in the late Summer, when the roots are hard and woody, yielding no more nourishment, a new generation of Leaf-lice appears suddenly, some wingless and some with wings. The wingless ones are females. These the ants place upon tender roots, as before, but they allow the winged Lice to swarm, even making openings in their nests so that they can emerge easily into the air. Some of these winged Lice are males; some females. Permanent reproduction by parthenogenesis is unknown in Nature. This last Summer group resumes normal fructification, and thus provides for the continuance of the race.

How long has Man known these things? For hardly a quarter of a century. But this secret has been known to the Ants for uncounted ages. They know that the winged Lice must come forth; must fructify in the open, following the same custom that prevails among the Ant People. The cattle which they own die in Winter. If they are to have more cattle in the Spring, freedom must be given to all that have wings; therefore they open all the doors.

After a very brief interval the plants are covered again with the winged Lice. The males perish, falling a prey to their numerous enemies; the wise herders are concerned only with the females. If the female Lice have laid eggs, these are gathered and taken to the subterranean chambers. If they are now busy at laying, the Ants help them, as a Cow is aided at calving time. If they have laid no eggs, the females themselves are taken prisoner. First the Ants clip their wings, so that they can not possibly run away, and then they take them below to their stalls. There they may lay eggs and then die; the herds of the next Summer must be provided for. The Black-haired Garden Ants have not such an easy task with their cattle as we men. All we need to know is that the animal with an udder is female and can be milked; that one without an udder is male and is useful only for breeding purposes. The Ants have to know much more. They milk none but the females, as we do, for the Summer generations are all female. Only the last generation contains both sexes; both winged. The winged ones must be set free, to go into the open, for the wondrous hymeneal flight; of which the Ants themselves, all old maids, know nothing by experience. All that return will lay eggs, from which new Manna distributors will be hatched next year.

The Garden Ants also hunt for Root-lice in the earth, digging passages from their nest in every direction, hunting as they dig. The prisoners are placed upon roots, which are carefully cleared away; a stall is built over them, and sometimes entire galleries for the entire herd. The Ants are quite as intent upon their hunting in the bowels of the earth as they are upon leaves, bushes and trees. Whatever applies to the Leaf-lice is true to a degree for their other cattle, the Crickets and Leaf-fleas. All of them enjoy the protection and care of the Ants, permit themselves to be milked and give their sweet Manna to the milkmaids.

It is slightly different with the Lightning Bugs and the Blue Wasp-grubs. Both of these give, not Manna, but something more like the milk from our Cows. The Lightning Bugs have no less than twelve glands from which they allow the sweet fluid to flow when they are tickled with the feelers of the milkmaids; like the Leaf-lice. The Blue Wasp-grub has two sack-like glands, surrounded with bristles, on the hinder end of the body, which can be tilted. From these udders they give forth a sweet, colorless milk when stroked by the Ants. These Grubs are pursued constantly by certain Wasps and Flies which lay their eggs in them. The Ants protect them from these foes. Some species, such as the Emerald Green Leaf-weaving Ants, build great silk-woven barns for them, while other species take them into their earth-nests, feeding and milking them there. In the latter case the Ants must bring them their food, just as the peasant brings fodder to his cattle in the barn. This necessity does not continue very long, for the Ants take in the Grubs that are near the pupal stage, and in that stage they eat nothing. The Ants get very little of value from these Grubs, of which a large number are often found in their nests, their care having to do chiefly with protecting them from their foes. When the Grub is ready to creep out of its chrysalis, the Ants aid him in getting out, although they get nothing for this labor. But they know very well that these creatures will celebrate their wedding in the open air and lay eggs, and that these eggs will yield Grubs for the Ants to milk. Could we ask more foresight from the Ants?

CHAPTER IX

STRANGER GUESTS IN THE ANT STATE

Many myrmecologists are not nearly so much interested in the Ants themselves as they are in the many thousand creatures which find place in the Ant-nest, some of them as welcome guests, but much oftener as most unwelcome intruders. These insect guests may be discovered any day, receive beautiful names and be arranged in fine order. They may be studied to your heart's content, picked out, examined, identified, numbered, registered, grouped, classified, schematized, modified, and catalogued. Then they may be coördinated and combined, philosophized about, problematized, differentiated, specialized, and the theories of all other observers may be criticized, developed, improved upon, ad infinitum. Every pedantic professor enjoys this game of renaming, in Latin and Greek, dog-Latin and worse English, French and German, until the head of a layman swims with their follies. That is a triumph for real science. Having done this the pedant may lie down ready for burial with the proud consciousness that he has done something *positive* for exact science.

* * *

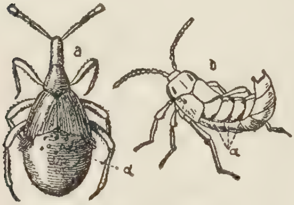
The milk-cows of the Ants, the Leaf-lice, Leaf-fleas, Wasp-grubs, are not to be counted as guest-insects. They are for the larger part useful animals, sometimes kept in the nest, without objection on their part, because the Ants use them. The larger number of their guests come into their nests because they wish to do so, or from instinct.

First there is the army of internal and external parasites. It seems that there is no animal so small that it does not harbor a host of other animals within itself and upon itself. We humans know of Lice and Mites and Tapeworms, and many other unpleasant creatures from which we have to protect ourselves. The Ant is no better off and suffers from similar pests, at times becoming their victim. While these pests attack the individual Ant, there are others alien to the Ant State which operate against the entire people. There are very few of these which are not harmful to the Ants, or serve them in the least degree. The Ants know very well what to expect from the incursions of various thieving guests.

They often trap these pests just as we do Rats and Mice, or fight them as we do the Lice, Cockroaches and Fleas. It is a perpetual struggle, with changing fortune. Among these aggressive robbers special attention should be given to the Ant-robbing Beetles, which are like Wolves and Jackals, and are heartily abhorred by the Ants. They steal the young brood, whenever they get an opportunity, but also attack the adults. They hide in small crevices and devour the dead and ill Ants. At eventide they crouch at the entrance of the nest, and jump on some of the tired citizens returning home late from work. A crowd jumps upon the poor Ants, tears them to bits and fights for the prey. At night, they creep through any unguarded door, pass along little used passages and fall upon the sleeping Ants or those which are chilled by the cold into torpidity. If an Ant comes across one of these hyenas, it attacks at once, but the Beetle defends itself with an evil-smelling salve which makes the Ant draw back. In this way the robber often saves himself, but at other times the Ant attacks and slays it.

Other guests which act inoffensively are borne with by the Ants. They even help them to clean the nests, as they eat up the offal, before the Ants can carry it out. Usually they are so small as to arouse no comment. These too steal the eggs, and when they do are devoured by the Ants. Most of these guests which they endure, especially the larger, have developed certain shapes which make possible their existence in the Ant-nests. Some of them ape the Ants with which they live in form and color, in a most amazing way. Others have grown such thick armor that the most powerful Ants can not penetrate it. The Wandering Ants especially are accompanied on their travels by a host of these guests, for wherever the Hun army penetrates, there is a surplus of killing and murdering, and many fat remnants are left for the light-fingered camp-followers.

The guests which grow such thick armor as to resist all attacks of the Ants are for the most part of the Beetle tribe. The Ants seem not to know what to do with these comical companions; they tug at them, roll them over, like barrels. At times they lick them or give them a few drops from their crops. The Beetles make themselves useful in return, eating up offal and devouring the Mites on the Ants. Their value to the Ants is limited, but they do no harm. It seems as if the Ants were accustomed to these fellows and like to play with them. The Arrow-tailed Beetle is quite useful in devouring Ant-mites, while others, such as the Hanging-lipped Beetle, are apparently mere playthings for the Ants.



Ant Guest Beetle (a)
Lomechus Strumosa (b)
α-Pores licked by the Ants

The Silver-fish Beetles are smart enough and expert enough to snatch morsels from the very mouths of the Ants. When one Ant is feeding another, there stands one of these little fellows, who jumps up and grabs the drop that one Ant is tendering a hungry sister. This passing of food from one to the other is the common family procedure among the Ants; they stroke one another not only with the feelers but also with their front legs to get the food. Long before the Ants release one another from this embrace, the little Silver-fish has swallowed the sweet drop and run away to a safe distance. The two Ants look after him reproachfully, while the loafer is repeating his trick on two other Ants.

Other guests try the stroking successfully. They lick the Ants in their own fashion and devour the Mites on them. The Ants let them know that this is not unpleasing to them. The Ant-cricket performs this office, and like the Silver-fish snaps up the drop which is passing from the mouth of one Ant to the other. Then too there is a small cockroach, which lives with the Mushroom Growers. This runs around their large soldiers, and accompanies the males and females even on their wedding-trip through the air. The Split-body Beetle considers the oil with which the Ant's body is anointed most delectable, and secures it by the friendliest of stroking and patting.

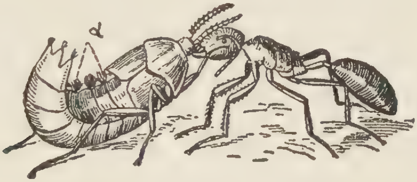
* * *

The Ants have guests of all kinds in their nests: those to which they are more or less indifferent; others that are robbers, stealing their brood and attacking them, when at an advantage. These the scientists have called Synecthrans, because of the mutual hatred which exists between them and the Ants. Science has given a special name to another class of Ant-guests, calling them Symphilia, because of the affection which the Ants show them. The Ants carry this love so far as to bestow it upon the brood. The name is incorrect, however, inasmuch as there is no show of affection toward the Ants from these guests. In fact, the effect of most of these guests upon the Ants is quite evil. Almost all of these so-called Symphilia, beloved of the Ants, are Beetles. They might also be called wolves in sheep's clothing, or real vampires.

> "There was a fool and he made his prayer
> (Even as you and I!)
> To a rag and a bone and a hank of hair
> (Even as you and I!)."

With the main difference that Kipling's Vampire was a woman and the fools—you and I—are men, while the Ants that are so crazy about a "Hank of Hair," their beloved, are all adult virgins. This golden hair is an ancient witchery, by which many Lorelei have caught the stupid, love-crazed sailors. These Symphilia are the Lorelei of the insect world: beautiful, long, golden hair is the means of enchantment by which they mislead the otherwise clever Ants. When a real golden-haired witch gets us, all is over with sound human understanding and Ant instinct.

The golden-haired witches display no shyness; they are quite conscious of their worth and the lure of their locks. Thus the relation between these Beetles and the Ants is different from that of any other guests. While some of the visitors have made their way into the Ant-nest, to get what they can, and run away, relying upon their swiftness to escape, or upon the thickness of their armor to resist attack, the Symphilia act as if the entire Ant State belonged to them, as if the Ants were created for their benefit and solely to serve them. They are always surrounded by a host of admirers, ready to do anything in the world for the possessors of the golden Lorelei hair. What a transformation is worked through these enchanting gold locks upon the usual proud owners of the Ant City!



Ant Feeding Beetle. *a*-Horny Ducts

These Beetles have glands at various places on their bodies, the openings of which are marked by a hairy growth. From these pores they emit a thin, almost etheric liquid, which moistens the golden hair, and has a most alluring fragrance for the Ants. The ether itself, even more than the fragrance, lures the Ants. The drops taste like nectar to them and—the chief thing—they also intoxicate.

After Mephisto gave Faust the "mixed drink" at the witch's bar, every woman appeared to Faust as Helen of Troy. It is quite the same with the Ants. Just one little drop of this enchanting ether from the golden-haired one, and in each one of these ugly Beetles the Ant sees an Achilles or Apollo of the insect world.

But to leave all bewitching poesy and come down to actuality; this fragrant, intoxicating ether from the Golden-haired Beetles lures the Ants just as valerian does Cats. Every school boy who wanted to tease his revered school-teacher or some old maiden aunt has experimented with valerian upon the Cats to create a concert, with the best possible results. He knows that the Cats become intoxicated by it just as these Ants do with their ether. The Ants become intoxicated to so great a degree that serious consequences may ensue, not only for the individual, but also for their entire People. It is true that the Golden-haired Beetles do little actual injury to the Ants by their witchery, causing only thirst and desire, but neither illness nor death, but tragic results flow from certain Lice which realize the influence of the Lorelei all too astoundingly in the insect world.

These Lice do not live in the Ant-nest, but wander in the forest. It is the one exceptional insect known to us outside of the Ant State. They have an intoxicating fluid under their golden hairs. Ants of the Long-necked species are their victims.

These climb the Lorelei rocks—bamboo reeds—and drink this liquid of the vampire-witch. One after the other, they gulp the rapturous liquid, one after the other they fall to earth swooning with joy. Slowly, cautiously the witch creeps down at last, no more a golden haired charmer, but now, what it really is: an old louse pursuing its loathed vampire work. It takes hold of the first Ant, lying deep in debauched slumber, and sucks its blood. It sucks the blood of the second, of the third—it does not stop until the last Ant is merely a shell of chitin.

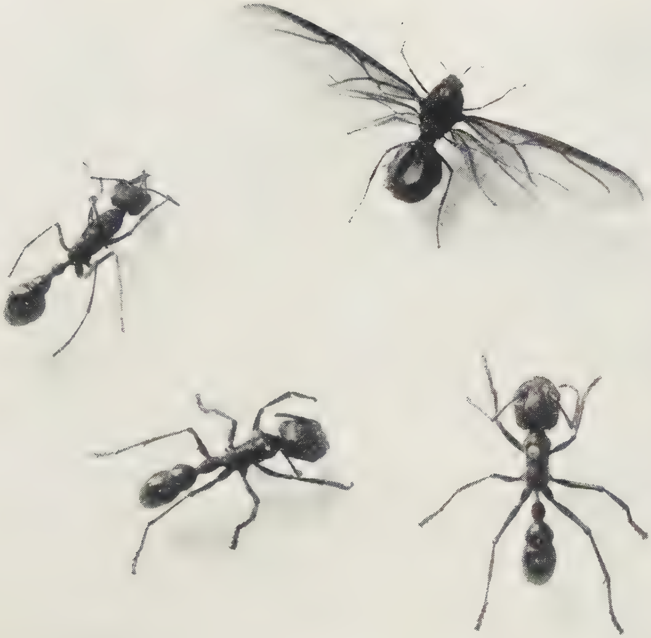
Ant-like Beetle

The Flea that became almost an Ant.

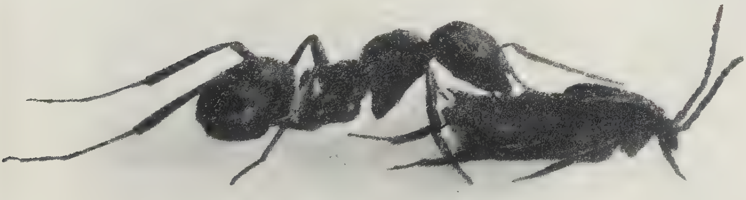
This tale of the Witch-lice and the Ants, their golden locks and sweet liquor, is most edifying. Every male or female prohibitionist can use it in a sermon, to prove to the drunkards what a horrible end they face. It may help!

But the Beetles in the nest are actually more dangerous to the Ants than the Lice on the bamboo reeds. These find some individual victims, few or many, but the beloved Beetles often bring about the destruction of an entire people.

There are three species, chiefly, which have crept into the hearts of the Ants: the Paussus Beetle, the Club and the Fringed Beetles. Besides the fragrant hairy ducts they have also to a degree developed other characteristics which are not found in insects that do not live exclusively in Ant-nests. In some of them is a peculiarly shaped tongue, which, due to being fed with liquids by the Ants, has taken on a special sponginess. The evolution of their feelers is even more interesting. Some of the Paussus species are notable in this respect. Being much larger than the Ants and much too heavy for them to carry, their feelers have become real firm grippers, by which they can hold on when carried hither and thither. Morever, the Paussus has a very formidable weapon, used when attacked by some foe: it can squirt pure iodine from glands in the hinder body. Even the Club Beetles, much smaller, easily carried by the Ants, which carry them around on their backs, are remarkable creatures. They have eyes indeed, but can not see; wings, but can not fly. They have developed special feelers. Some species have them like claws, others for delicate touching, which they use as the Ants use theirs. They seem to have learned the Ant Language, and can say: "Give me some food



Leaf-cutting Ant. Bull-dog Ant.
Two Skunk-Ants below.



Ant Sucking the Etheric Liquor from the Blonde-Hairy Ducts of a Beetle.

right away!" and they can say it so clearly that they get it immediately.

All these Beetles live a truly parasitical life in the Ant City. They are carried or dragged around by the Ants, are fed and cared for and in return allow the Ants to lick the golden-haired ducts. The intoxicant does not seem to harm the Ants, but acts as a stimulant; at any rate they become as much habituated to this drink as the steady drinker to his toddy. So far so good, but the Beetles are not content with the food furnished them by the Ants, they also devour the brood.

The Fringed Beetles have advanced farthest in this respect, especially two Eurasian species, the Tufted Beetle and the true Fringed Beetle, as well as an American species, the Guest Beetle. The Ants take better care of the Beetle eggs and larvæ than of their own, feeding and rearing them, while the Beetles themselves are spoiled and fondled endlessly. If the nest is attacked, the Ants rescue the beloved Beetles and their young before their own. Tufted and Guest Beetles have gone so far in understanding the Ants that not only do they stroke the love-sick "aunties" with their feelers but when they wish to be fed they stroke their cheeks with their forelegs, Ant fashion. Both species manifest many alterations and adaptations to the people which they bless with their company. In the Spring they leave the people with which they have wintered, and go to some other nest, possibly of quite another Ant species. There they lay their eggs, which they leave to be cared for by the Ants of the new nest, while they, in the late Summer, return to their former hosts, or to another people of the same species.

The reason that the Tufted Beetles and Guest Beetles change their home seems to be that they have found out that too great devotion may bring ill results. They are small, delicate creatures, much weaker than the devoted, serving Ants. In the heat of Summer, even man is more thirsty than on cool days; he looks for a good long drink. The Ants are quite the same: on these warm days they lick the golden hairs of their beetles so ardently that they squeeze them, to get the last possible drop of this entrancing liquor, and they pull so hard at the hairs that the Beetle is wounded; and when this happens he is devoured at once. This is literally "loving to death." We might almost compare it to cannibalistic lust-murder, of which we have many instances in our criminal records. When one of these Beetles falls a prey to this loving to death, there is no stopping the raging thirst in the nest. In a twinkling every beloved creature is torn to bits. To avoid this the Beetles go away. They leave their brood, which is carefully reared. The Beetle larvæ avenge the murder of their parents, as they now devour an enormous quantity of the eggs and larvæ of the Ants. Meanwhile the Beetles go to some other Ant species. During the journey of several weeks the desire for their enchanting liquor has been renewed, and they are received with open hearts and jaws by their winter-hosts, a much smaller species of Ant, which can not kiss with so much vigor. In the Spring they return to their old friends, as if nothing had happened, and are again joyfully received and accompanied home in triumph. The Tufted and Guest Beetles are not the only creatures that have to protect themselves from the too ardent affections of the Ants on the hot Summer days. This love is far more dangerous to the young Beetles, even to those in the pupal stage. The Beetle larvæ which have been kept with the Ant brood can dig themselves in and emerge as pupæ, but if an Ant finds one of these pupæ, it is devoured at once. As soon as the young Beetles emerge from the chrysalis, their motto is "Save yourself, who can!" They feel instinctively that their chitin armor is too tender to bear the tender licking of the Ants, and they flee, head over heels out of the nest, followed by the Ants which try, usually in vain, to recapture them. They stay in the open until late in the Summer, when they return to their winter hosts.

On the contrary, the Fringed Beetle usually remains with the chosen people of the race of the Blood Red Slave Hunting Ants. The Blood Red belong to the highest order of Ants, and they seem to suffer most from the plague of the Fringed Beetles. The Ants love their bewitching liquor and golden locks. These Beetles lay their eggs with those of the Ants. The brood is carefully reared by the Ants, quite as carefully as their own, but the larger Beetle larvæ are very greedy and are not satisfied with the food brought to them; they devour a large part of the eggs and larvæ of the Ants. Nevertheless the enthralled Ants continue to serve them, neglect their own brood and even the Mother-Queen more and more, so that only a few males, no females and only small, weak workers are produced. Now a peculiar transformation takes place in the nest: a number of Ants are produced which are called "false females," seeming to be something between workers and true females. They indeed have feminine breasts, but their bodies and heads are like the workers. In addition they are pale, lazy and cowardly, altogether different from the Blood Red species whence they come. These pariahs, which are of little value in the Ant State, become more and more numerous every year that they have the Beetles as guests. The devoted state, now eternally doomed, becomes weaker and weaker. This form of "false females" appears only in those states in which the Fringed Beetles are guests; in a nest without these guests, they never appear.

Many have been puzzled to explain this rare occurrence. It is admitted that both the Queen-

Mother and the eggs she lays are healthy, so the reason for the remarkable malformation of the offspring must be sought during their development. The simplest and most enlightening explanation seems to me to be that the "false females" come from female eggs which have not been properly nourished during the larval state, and therefore could not develop into real females. Whether the reason for this lack of feeding is due to the fact that the Ants give all the food they can furnish to the insatiable Beetle larvæ, so that nothing is left for their own, or that they cease to feed their own larvæ intentionally, in an attempt to make real female workers out of them, and in that way to compensate for the falling off in the number of laborers, must be left undetermined. It is possible that the otherwise clever Ants have made a mistake, for to err is Antly, just as it is human.

It is due to an error of the Ants, also, that as a result of the dangerous love for the golden-haired Fringed Beetles the race of the Blood Red Ants has not long since been exterminated. The error is, that the Ants that have to do with the nursing in the nest take care of the alien brood as well as of their own. This care of the Beetle brood is most valuable, except for a trifle. The Ants aid their own brood, and the alien as well, in the pupal stage, bedding the larvæ down in the earth. If a larvæ has emerged, it is dug up, and the pupæ are dragged around, first to one chamber, then to another. This is the best possible procedure for the Ant pupæ, but it is not so good for the Beetle pupæ. These long to lie in the ground, and not be bothered. On account of the over-loving care bestowed upon them, they perish, one after the other. Only a few of the pupæ survive to develop into Beetles, and these are the ones the Ant-nurses have neglected to dig up. The small mistake of the Ants in treating the brood of their beloved so tenderly and assiduously, as they would their own, is due to the fact that they have not grasped the idea that Fringed Beetle pupæ should lie quietly in the earth, and to this mistake the Blood Red Ants owe their continuance. If they ever correct this error, they will find out how fatal has been their dangerous love for the golden-haired witches and their intoxicating liquor.

CHAPTER X

ANTS AND TERMITES

Ants resemble other creatures in many respects, and are more or less closely related to at least one great family, the Termites.

It is not remarkable that most persons know little about Termites, for they live only in the tropics. Yet we may be keenly interested in creatures which we never see, and have many false ideas concerning them. This is especially true of the Termites, so generally confused with Ants. The newspapers are largely to blame for this, as frequently they speak of Termites as Ants. This has become habitual in England and America, where the Termites are called White Ants. The name Termite is in itself very stupid. It is due to another error, that of considering the Wood Beetle a species of Termite. An ancient superstition taught that its tapping on wood indicated death (*terma*) to man.

Much as Termites and Ants resemble one another in their social existence, they are as little related as Tigers and Elephants. While Ants belong among the membranous-winged, the Termites are of the race of wood-lice, in the class of the Gnawers; or, to make it comprehensible to every one: the Ants are between the Wasps and the

Bees, while the Termites are nearly allied to grasshoppers. If I offer a picture of the life of the Termites, it is merely to show the contrast with that of the Ants, and to shed some light upon the life of the former. The possible evolution of the Ants is not at all denied; perhaps here lie many possible further developments for them.

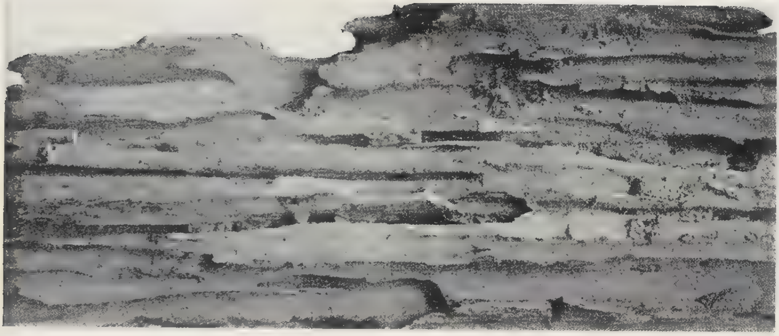
Termites, like Ants, have males, females and workers. Males and females have wings but the workers have not. These workers are not only females of arrested development but also males; correspondingly the Termites have a King as well as a Queen. Termites, like men, in contrast with all other insects living as a society, are not a feminine people, in which the males play a very subordinate part; there appears to be full equality between the sexes.

The division of labor is highly developed, and there are special types of laborers for special tasks. As among the Ants, we find soldiers of various forms. While the duties of so-called officers in some Ant species is not very clear, we know precisely what they must do among Termites. The smaller soldiers have only to keep order and take care of the interior of the city, overseeing the laborers at their work. The larger soldiers fight and keep guard. Termites use the feeler-language of the Ants and also, in some degree, use audible sounds. The guards of one species not only give the alarm-signal by beating their heads against the walls, but also, if the danger be great, utter an alarm-signal which is replied to from within the nest at once. Other species produce sounds by rubbing their heads upon their breasts; still others make a noise by gnashing their jaws together.

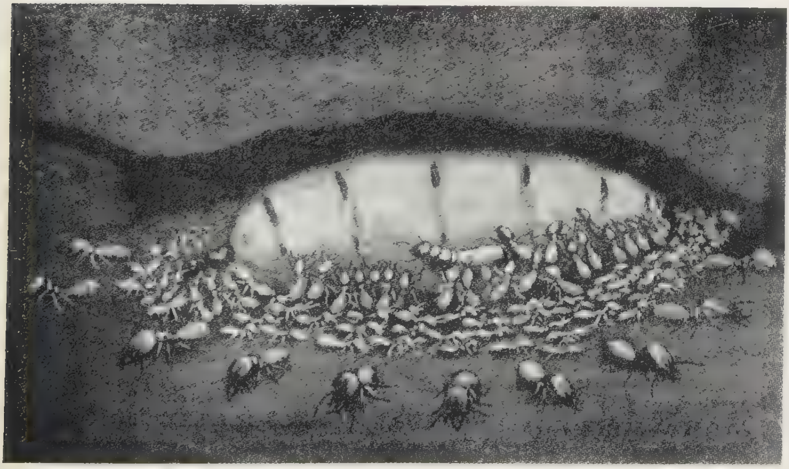
The young Termites, as they emerge from the egg—for they pass neither through the larval nor the pupal stages—are all exactly alike; they may be reared as females, males or workers. The Termites can determine the sex, even the forms, as the state requires. How it takes place we do not know; all theories put forth thus far are unacceptable. If more of one caste than is needed grows up, the state-thought sets to work: the superfluous members are destroyed and devoured.

The swarming time of the Termites begins with the rainy season, but it is not a hymeneal flight, as with the Ants and Bees. Rather, it is a wedding journey. The nest which was closed before is opened; the winged males and females hasten into the open and go on their journey. Both are still immature sexually. They fly about at first, then alight on the ground, where every male finds a female. Each rids itself of its wings, as the Ants do. Then each pair goes forward. They travel like a Chinese bridal couple, one following the other; but among the Chinese the bridegroom leads the way; among the Termites, the bride. Each belongs to the other "until death shall them part." The young couple dig down into the earth, or into rotten wood; build a small room in which they live together peaceably for four or five months as bride and groom. Peculiarly enough, and we do not know why, during this period they bite off one another's feelers, little by little. At the same time they are developing sexually, the hinder body growing larger. Now that the lovers have learned all about one another, through living together for several months, the bridal night is celebrated. A few weeks later the female begins to lay eggs. Both take care of these eggs and the young as they are hatched. The workers require a year and the winged Termites double that time to attain maturity. Thus at least a year must pass after their bridal for the young couple to have a well founded people, over whom they rule as King and Queen.

The Queen's body has been greatly swollen during this time. In some Termites the fertility is tremendous, filling states numbering millions of inhabitants. The royal couple remains in royal state. The mighty Queen lays her eggs, and her activity is interrupted only by renewed wedlock, at which the offspring assist, and would look on were it not that they are blind. Hundreds of the workers feed the Queen and keep her perfectly clean. The egg which she lays every two seconds is snatched from her body, to be taken into one of the nurseries. The King, smaller than his spouse, but larger than the workers, stands near by, and he too is fed and cleansed, but not quite so attentively.



Wood riddled by Termites.



The Royal Cell, Heart of the Termite Nest, in which the Eggs are Laid, to be carried out to the Nurseries by the Workers.

The workers are superintended sharply by a number of small guards, which drive them to their labors by smart raps with their heads. A few of the larger soldiers stand about on guard.

Meanwhile, the Queen grows larger, or rather her hinder body grows. She may live to the age of fifteen years or more, as does the King, and lay more than a hundred million eggs. If the King or the Queen dies, the Termites secure substitutes. They have in reserve a number of male and female creatures, sexually mature, but not full grown physically. They are distinguished from the real royal couple by the fact that the latter once had wings, which they cast off later, while the substitutes have only stubs and never develop wings. As a rule every Queen has her royal spouse, and in some very large states there are even several royal couples. Yet it happens that sometimes the Queen dies. Then the real King receives a number of concubines, and he leads the life of a sultan in his harem. In case there happens to be a winged couple in the nest where King and Queen have died, it is received in the old nest and becomes the royal couple. A couple on its pre-wedding journey is sometimes accepted by some orphaned people.

In the building of their gigantic cities the Termites outdo the best structures of the Ants. It is astonishing how precisely they seem to build according to plan. They do not start haphazard, adding to the structure whimsically, but begin at a series of spots so as to come together with mathematical exactness. The royal residence, of course, is the chief consideration, being built around the royal couple. Soldiers stand around them, forming possibly a dozen circles; thus they indicate where the work is to be begun. Urged on by them the laborers begin to build. Pillars are erected, then these are connected with one another, making walls. In the shortest possible time the royal chamber is completed.

This superficial account of the Termites is intended only to give a general idea to those who know nothing at all about them. Whoever desires to study them more thoroughly will have to take up some book especially devoted to them. Many species of Ants seem to fight the Termites savagely, and very few are on friendly terms with one another.

The Thieving Ants must be mentioned in this connection, for they live only in the nests of others, taking over for their own use whatever they find. These Thieving Ants not only live in Termite cities, but also follow their trade with other species of Ants. They will be discussed more fully in the chapter dealing with the Ants that live together.

There are other species of Ants, which do not practice theft, which live in the Termite cities. There are many reasons for this. As a rule it is because the Ants find a ready-built city and take possession of as much as they need. The Termites being weaker, and more peacable than the Ants by nature, proceed and build additional quarters for their new friends. In this way it sometimes occurs that we find five or six communities of Ants of various species quartered upon the Termites. These creatures, which often use the same passages and entrances seem to manifest a strange mutual patience: they seem to try not to harm one another, and not even to interfere with one another. Yet sometimes here and there a fight between individuals takes place, and sometimes it is the Termite, sometimes the Ant which survives.

The Ants belonging to the Stinging family are much more unpleasant for the Termites. When the Jumping Tooth-fighting Ants or the Lapped-armor Ants come to or near a Termite city, it is not to steal, but to murder and to devour the slain.

The Jumping Ants, although a very dangerous and well-armed adversary, nevertheless have a wholesome respect for the Termite soldiers and avoid them, when they can, so as to have to deal only with the weaker workers and the half-grown. But the Lapped-armor Ants, one of the most savage of the Stinging Ants, takes up the combat with their bravest officers, takes hold of soldiers and workers alike and leaves a gory trail in the Termite city. They consider Termites heaven-sent and tasty food, living almost exclusively upon them.

CHAPTER XI

LIVING TOGETHER

If any social creatures have the right to be termed national, it is the Ant Peoples. Each Ant works little for herself; very much for the whole People. The structure belongs to all in common, as do the cattle, the mushroom gardens, the stored grain; even the food which the individual carries in her crop. The young brood is common property, as well as the Mother-Queen, in whom the folk-thought is made concrete. All the love of each Ant belongs solely to its people; all that does not belong to the people is condemned, whether this be other insects, Ants of another species, or other peoples of the same race.

We have seen that there are exceptions to this rule. Thus some species of Ants have a very dangerous preference for stranger guests, such as the golden-haired Fringed Beetles. At times, too, other relations than enmity exist between the Ants; they even reach agreements.

In this we find a striking resemblance to humanity. In many human states, side by side with the ruling people one or more other peoples live. The relations between them vary so greatly that thick volumes have been written on the subject.

Outwardly friendly relations exist, as in Switzerland, where, for many years, Germans, French and Italians worked together as Swiss citizens, in equality and with fine coöperation. We find the opposite, as in Turkey, where the Kurds and Armenians are in constant conflict. There are countless stages between these two; we can hardly pick up a newspaper without finding some mention of one or another question of the relation of a guest-people to its host. Now it is the question, in North America, of the negro in the Southern States, or of the Japanese in California, or the Indians on their reservations; in Great Britain, it is the Irish question; in Eastern Europe, the Jewish question. There are German problems in all the border-countries, a Lapp problem in Sweden, a Basque problem in Spain, a Gipsy problem everywhere. Some nations have two, three, a half dozen of these unsolved national problems. If the Ants had newspapers, they would sing the same song daily.

Unfortunately it is not true that there is room for all on the earth. There is not nearly enough room for increasing humanity, or for no less multiplying Antdom. Every place does not appear suitable for a nest, to the Ant; one offers this advantage, another that. In this way an especially good place will please one people as well as another, and for this reason often we find several of the young of different species under one well placed stone, or under the bark of a fine old tree. As the nests grow larger they must verge upon one another, one sometimes swallowing up the other. There is frequent fighting about and in these neighboring or infringing nests. Often the people tire of these constant fights. They may establish an armistice, and let one another strictly alone. Nests of this kind are usually the result of accidental nearness. If one of the peoples becomes larger and more powerful, it usually drives the other people out of the nest. When they are living together, each has a section of the nest, and they seldom meet inside; the armistice applies only outside of the city. If one of these double nests be destroyed, the two peoples in it attack each other violently, seeming to blame the other for the destruction.

Some species of American Ants go a little farther, living in the same nest, without any walls of separation. These are peaceful, timid races. They live in different parts of the nest, often an abandoned Termite nest, keep house separately, and only take care of their own brood. They pass through the same exits, to attend to their different tasks; one to milk the cattle, the other to gather grain. This kind of living together seems accidental, as all of these species usually build their own nests.

It is designedly that any species of Ants comes close to or makes its way into the nest of another people. It may have use for the better method of building practiced by the other, or merely to save itself the labor of building, by taking possession of the other's home. We humans have learned something of this method used by the Ants during the last few centuries. Respect for the property-rights of the other people in Antdom prevails only if the owner is strong enough to enforce his rights. Mankind has not disdained to learn this from the Ants.

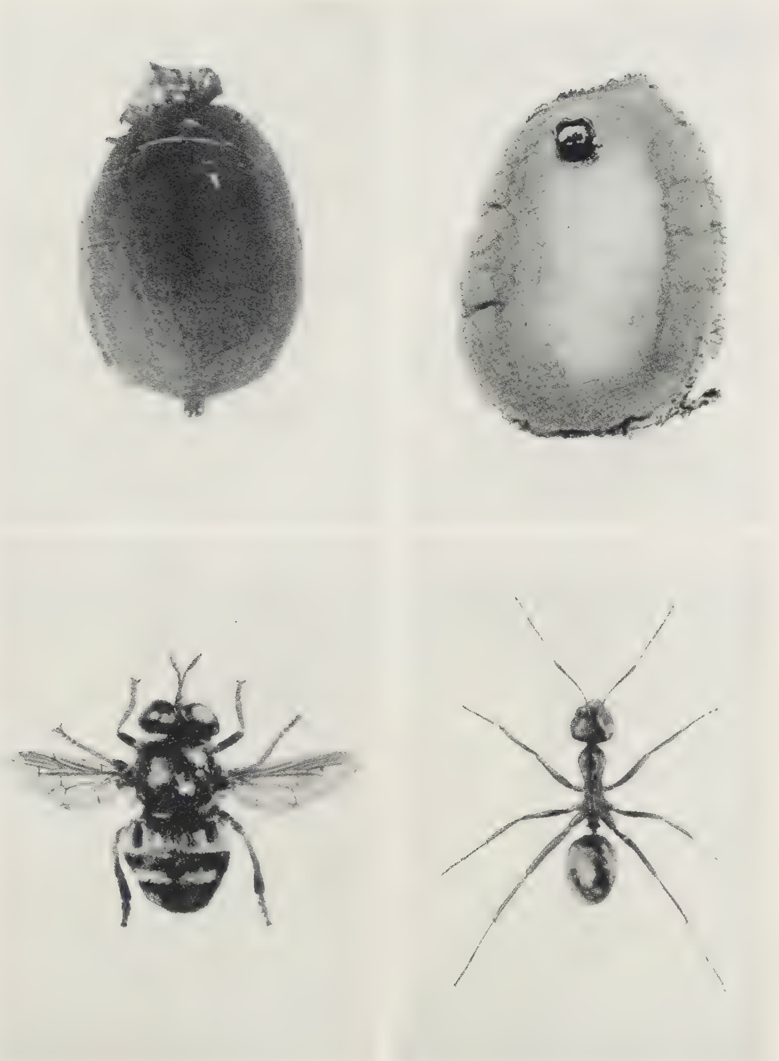
These forced invasions are matters of every-day occurrence in Antdom: one species is driven out of its home by another, or from a part of it. The new owners may have to make room later for a still stronger people. In this change of ownership, those driven out take their brood with them, as a matter of course, for the eggs or larvæ of another people would be eagerly devoured by the invaders. In other cases the invaders are more intent upon the booty they can get than upon the dwelling itself.

The Harvester Ants of western North America are splendid architects, whose solid nests arouse the envy of other species. Around the nest is an open space, in which are smooth, flat craters. These craters have been plastered carefully with small stones by the mighty peoples of the Prairie Ants, or, to express it better, roofed; for it is the roof, not the floor of the Ant State that has been covered with these stones. Inside of the earth-nest some stones are found only in a few of the chambers, all the others being paved with earth, and the stones used for the ceiling. Sometimes petrified bones or shells are used for the ceiling work. Even bits of gold have been found there, so that the legendary tale of Pliny of a species of Gold-gathering Ants of India is partially substantiated. The stones are set close to one another, forming a perfect protection from rain. It is no wonder that a nest of these Ceilers is highly regarded by all the other Ants.

The Harvester Ants of the Prairies are, in contrast with their Texan ancestors, of most peaceable disposition. They permit invasion usually very amicably; but when it comes to a fight, they show what they can do, and usually they conquer. Among the invaders of these Prairie cities we usually find those Ants that live by highway robbery.

These robber barons in the Ant World build small cones upon the beautifully cleared courtyard surrounding the artistic Prairie City. It is true, they too go a-hunting, like all good robber knights, but they have developed the art of waylaying to a high degree of efficiency. The Harvesters leave in a great host, to nip the ears and bring home the grain.

The small highwaymen have watched this carefully. Now they lie in wait, in great swarms near the nest, until some industrious peasant returns heavily laden. Then they leap upon her and take away her burden. The attack is so sudden that the Harvester Ant has hardly time to realize it; or it may occur to her, knowing how wealthy her



Grub of Fly born in Ant's Nest—(above).
Fly (to left). Ash-colored Ant, its host.

mighty people are, that they can spare these crumbs to the little upstarts. Be that as it may, they come to blows very seldom. The robbers examine the garbage heaps of the Prairie City, and find much that is eatable there; besides, if they get a chance, and can do it unseen, they snatch up some of the young brood of their hosts. Their assurance goes so far, that if the large Prairie Ants walk over their little nests, on their way home, they treat them as disturbers of the peace and fall upon them in great wrath. Then indeed does the burly peasant take up his weapons in earnest. Quite comical battles follow, with little real result; the nimble little Davids seem to be able to accomplish quite as little with the bearded Goliaths, as they with them. One will catch hold of the giant's leg, another will catch hold of the other leg or the feeler; in a moment the giant is covered with a swarm of the dwarfs, and whirls them around, throwing them to the earth. The strong peasant is happy to have shaken them off; she withdraws and combs her tangled whiskers. The peaceable Prairie Ant endures all this most amiably.

The highwaymen spoil the beautifully paved courtyard of the Prairie Ant and the symmetrically laid out streets, with their little cone-nests, so that the Prairie Ants have to begin repairing the damage. Frequently their patience is exhausted; they seem determined to end the nuisance once for all. They proceed just as the Mediæval cities did against the robber barons. It would have been useless to arrest one or two, especially since Nürnburg and other cities could not hang them, until at least they had taken them prisoner, which was no simple matter. Therefore they considered it more effectual to break up the homes of the robber barons. The wealthy citizens of the Prairie cities arrive at the same conclusion. In true peasant fashion they assemble, but not for siege and battle. They have no fire to smoke out the citizens of the robber baron nests, as they would like to do leaving them a way out, so that the knights and their friends might depart unhindered, but they have something which serves as an excellent substitute. Under their garbage heaps many rain-worms find a home. The ground is covered with the small balls which these worms make. The Peasant Ants gather large quantities of these balls, and throw them into the openings of the robber barons' nests. One door after the other is blocked up in this way; the besieged highwaymen are put to it to dig a way out, and the harder they work, the harder the besiegers throw their pellets. At last nothing remains for the robbers but to leave their castles with baggage and children. The Prairie Ants then go to work most thoroughly and sweep away, not one, but all of the robber castles in their territory, and for a while they are free from the plague of the robbers.

The Long-bearded Texan Ants are not of the peaceful disposition of the Prairie Ants of the

West, and they allow little privilege to the highwaymen. The impudent little robber knights attack them too, seeming to have no fear of the savage and powerful Long-beards. They, too, finding out that single combat is of little avail, soon sweep away the castles of these robber knights.

The little robber knights are not the only insects which fall upon the brave peasants and steal from them. On Insulinde, one of the Malay archipelago, where the golden-haired Lorelei Lice are at home, which first intoxicate the poor Ants and then suck their life-blood, there lives also a begging Gnat and a highwayman Fly.

These robber Flies settle in swarms near the Ant roads, on a stone, selecting the spot from which they get the widest view. If a Hunter Ant comes along, laden with booty, the Flies hover around her, snatch her booty, and fly away, before the Ant has time to realize what has happened to her.

The Beggar Gnats are even more presumptuous. They too hover around the Ant roads, especially those that have been laid out by the Nurse Ants with the Hanging Stomach. They beg from them, Ant fashion, stroking and tickling them, until the goodnatured full-bosomed Hanging-stomach Ant, thinking that it has to do with some hungry sister, yields food freely from its crop-stomach. Not satisfied with this, the beggar begins to lick its breast. All these Nurses, so it is said, are dull of comprehension and the Nurse Ant is no exception. She gives the Begging Gnats her trusting bosom and allows them to have some of the Honey-milk.

Really she does not yield in this way because of her preference for the Gnats, but only because she mistakes the little beggar for her sister-Ant. If she encounters this same Gnat a little later, running across the road, filled to satisfaction, so that she does not beg, Ant fashion, the Ant treats her as she would any other insect. She catches her, tears her to pieces and devours her.

To the man who can steal unmolested by law or conscience it is a very fine pursuit, but to the man from whom the thing is stolen it is most abominable. Stealing and robbery is going on every day, all over the world, usually by individuals, more seldom by armed bands of thieves. Antdom may be reproached with having entire peoples devoted to robbery and theft, living in this way alone.

These Ant-thieves are not barred either by law or conscience. The only law in Antdom is to do everything possible for the welfare of one's people; and since their own people is to be helped only by robbery and theft, these Ants naturally consider it not merely permitted but praiseworthy. Every Ant steals and robs, but the Thieving Ants have developed a splendid method of nourishing their populous nests.

The Thieving Ants place their own nests hard by, or within, the nests of other Ants. They are very small creatures, the smallest Ants known to us. The passages into their nests, which sometimes lead into the nests of the larger Ants, are so narrow that the other Ants can hardly find room to pass their feelers into them. Thus, if the Thieving Ants reach these passages, they are absolutely safe from pursuit; yet, in their nests, some large chambers are found, which are needed by the sexed Ants, as the males and especially the females are very much larger than the workers. The Queen—or the Queens, for the Thieving Ants have an entire series of fructified Queens—are, to judge by their enlarged hinder bodies, very fruitful. As a result the population is great, reaching the hundreds of thousands, even the millions.

Passages of Thieving Ant so small the Hosts can not enter.

These powerful peoples feed themselves at the expense of their hosts. They even go so far as to help themselves to their eggs, larvæ and pupæ.

But the term "Thieving Ants," as in so many other instances, is most unfortunate. We humans certainly would not call by the name of thieves other men who stole our children to eat them. Names and designations should be bestowed so that they convey a clear idea, and not a false notion, but science seems to work the other way about; the more deceptive a name is, the more certain is it to be adopted. Thus the European Thieving Ant is known as *Fugax* (fleeing), probably because it is not at all quick in its movements, but very slow. Then that wise old "Aunt Science" says, this fleeing does not refer to its movements, but refers to the fact that this species flees from light.

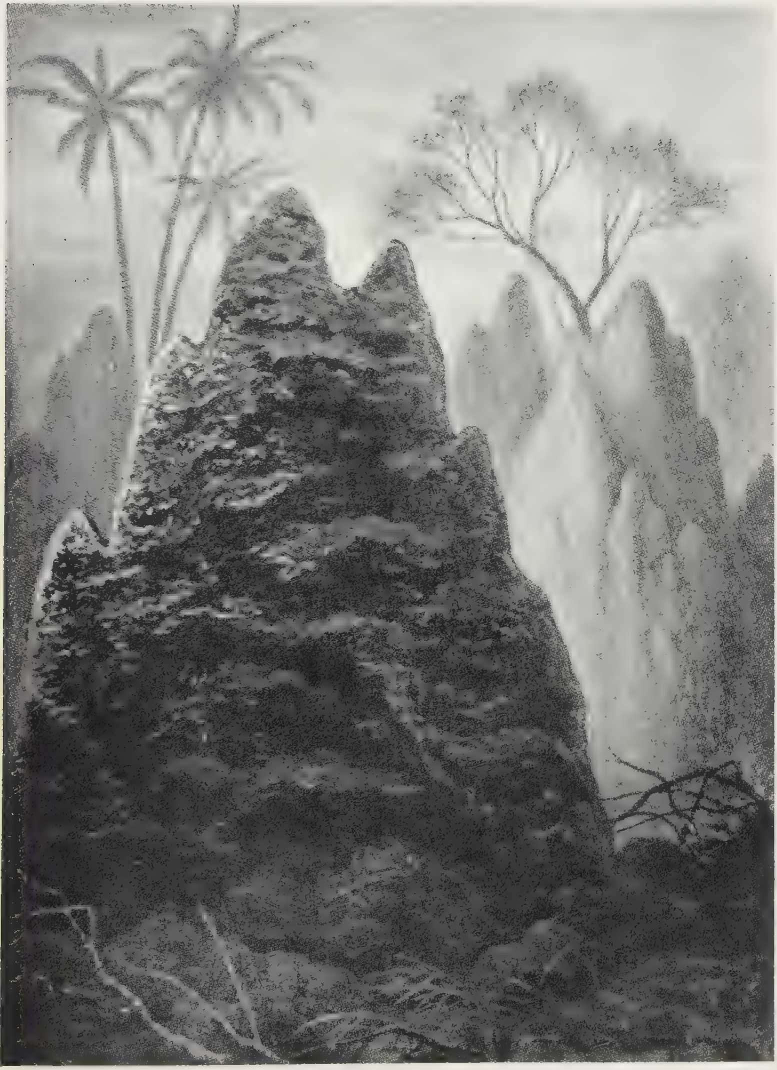
But this little Ant does not think of escaping the light. The fact is that it lives far away from the light, under the earth, because that is the place in which it finds its titbits. It uses its vision very little, being able to see hardly at all. It is certainly not more afraid of the light than other Ants. These Thieving Ants are easily studied in an artificial nest. They place their nest preferably nearest to the light, by the glass wall. Science must know this quite as well as I do, for I am certainly not the only one to have studied Thieving Ants in an artificial nest. But it seems to be all the same to the pedants; they gayly name them *Fugax,* fleeing, though they never flee! *Fugax,* afraid of the light, which hardly notice the light at all!

If these Nurse Ants of the hospital people do try to take good care of the brood, it is certain that they are never safe in their cradles from the child-stealers. The latter dig passages through the earth and if they manage to gain entrance into a nursery, the slaughter is frightful. Of course the robbers have other food, but only when they must use it for a change, in the absence of these delicacies. They devour insects, whether dead or alive. Sometimes they stop Root-lice to milk them. They condescend to utilize the cattle kept by their hosts, milking them or devouring them—all is fish that comes to their net—but their chief delight is the brood of other Ants.

Naturally the Ants that are robbed do not like this and try to protect themselves as well as they can, but they succeed poorly, even though they are big, brave, strong, and fierce, like the Blood-red Ants. Much larger and stronger than the contemptible little dwarfs, they receive considerable injury in a fight. Besides it is very difficult for them to catch the little fellows, which take hold with Berserker rage, hanging to their legs and feelers. The robbers have a sting, which spurts a powerful poison; if stung by them, the giant falls down writhing in convulsions. They usually fail to catch the little Ants, but if one of the robbers is caught, it is cut to bits in a moment by the powerful jaws.

The Thieving Ants live not only in the nests of other Ants, but also in Termite cities, behaving in the same way, or stealing even more. If, looking at it from a human point of view, we do not regard the eggs, larvæ and puppæ, which move very little, if at all, as real children, this mitigating circumstance does not apply at all in the Termite nest. The Termites have no real larval or puppal stages. The young creep out of the egg, much like the adults. The robbers of the Termite brood have made this "Slaughter of the Innocents" a regular mealtime, a mere detail of their lives. And they enjoy this living by murder so well that through it they develop their sexed creatures into enormous monsters. The workers themselves must still remain very small in order to follow their business of robbery, and their pride centers in the Mother-Queen. Some species, such as the Carebara, have gone so far as to develop Queens which are more than eight thousand times—figured in cubic contents—as large as the ordinary workers, so that in crawling around them to keep them clean, they seem like fleas on a dog. Besides, in Termite states we find a real Thieving Ant, one which is actually deserving of the name, and is not merely a robber and murderer of the brood.

This, the only real Thieving Ant thus far discovered, lives with a species of mushroom-growing Termites of Ceylon. It lives and nests in the mushroom gardens. It does not steal the eggs or kill the young, but quietly steals from the mushroom garden. It is a relative of the Pharaoh Ant,



Nest of the Termites, "White Ants." A Mass of Magazine Chambers, with a Central Core of Smaller Cells, probably Nurseries. They are sometimes Twelve Feet Tall.

that little House Ant, which, during the centuries, has spread over all the inhabited earth, and which does its stealing from man, not from other Ants or Termites. It becomes unpleasant enough, even though the human young is too large for it to take away, but it is a nuisance just the same.

* * *

If I invite a man to my rooms, being a good fellow, I place my establishment at his disposal, give him food and drink, even pajamas and shaving implements, he must only bring his own toothbrush. The ancient Greeks, and some negro and Indian tribes go even further in their hospitality, making them completely at home in every respect. The great professors who gave the Guest Ants their Greek name, calling them *Formi-coxenus,* Ant-guest, must have had a very remarkable idea of the hospitality which was practiced among the Hellenes.

But the Guest Ant does not enjoy the least hospitality from the host-people. It receives neither an abode nor anything to eat; it is not even greeted by its host. Nevertheless it builds its own mean nest within the nest belonging to the other Ants and uses their roads. It has simply established itself in the alien city and uses it as freely as possible.

The nests of the Guest Ants are the only ones in Antdom that are worthy of the name. They remind us of the birds' nests. They are about as large as half a hazelnut and have the shape of a small bowl. Sometimes they utilize empty beetle-pupæ, especially those of the Gold Beetle, which prefers to pass the pupal stage in Ant-nests. The Guest Ants are larger than Thieving Ants, but their sexed Ants are much smaller than those of the Thieving Ants; no larger than the workers. Their number is limited, sometimes not more than a hundred, among which are an undue proportion of males. While the females resemble the workers, they are winged, but the males are wingless and precisely like the workers.

The Guest Ants are quite harmless; their greatest pleasure consists in riding pick-a-back. One gets on the other, clasps its jaws around the neck of the other and holds on tight. Sometimes a third mounts on the back of the second. The male is often the rider, the female the beast of burden: thus these comic steeds play at their game of life.

As the males are wingless there can be no hymeneal flight; the mass-marriage takes place on the surface of the nest belonging to their host, seemingly permitted without question by the host. The observer will note, with astonishment, that the males meet not only with the females but also with the workers. It is not to be supposed that the males do not know the difference between the females and the workers; for the latter are really females, and though wingless, are in other respects like the Queens. The Guest Ants really have two types of females.

Within the great city the modest Guest Ants lead a shut-in life. Their hosts have found out that these shining little creatures are quite harmless, and allow them to stay there, but they do not bother about them. If one of the Wood Ants, with which they live, meets one of them, it runs along without noticing, sometimes walking right over the little fellow, knocking her to one side. She thinks nothing of this, in true Ant fashion, never trying to avenge herself upon the bigger Ant. At times the Wood Ants stop the agile little sisters, as if they were asking what they were doing in their city; feel them, and take them up in their great jaws. The shining loafer pretends to be dead, and utilizes the first opportunity given it by the big sister to slip out and away. The Guests manifest a similar patience and frightened forbearance towards the Beetles which live in the nests. The latter are always trampling on their little bowl-nests, and breaking them, pushing them aside, and knocking them over, but the little Ants accept this as the decree of fate, against which none dare complain. In this way their peaceful patience helps their acceptance: they are endured in the great city as poor beggars who are not worth caring about.

The Wood Ants and Wood-meadow Ants with which these little strangers live, have no profit from them, and the Guests have only the protection. But it must appear to them worth while, for they never nest independently. If their hosts leave a nest and found another elsewhere, the little Ants take their brood with them and establish their nests in the new home.

* * *

In the northeastern part of the United States and sections of the Canadian border, there lives an Ant which is erroneously compared with the so-called Guest Ants of Europe. This little Ant, belonging to the Narrow-breasted Ants, may more correctly be termed a friendly guest. It builds its own small nest in the alien city, dwelling there independently and rearing its brood. It is separated by walls, but has its own small entrances. The little Ants hasten through these into the city to get their food—and they get it all by systematic begging.

They have developed their own method of carrying this forward. They climb up on the first citizen they meet, and begin to lick her head. At the same time they tickle her with their feelers and beg for a little favor. Every Ant likes to be licked, and she stops to enjoy the sensation.

The beggars know very well where they can find something; they give the preference to the Ants which have just come home. Their hosts are wealthy cattle-herders, and those returning home have just milked their cows, and are carrying their milk-pails (their crop-stomachs) overflowing with milk. The citizen opens her mouth and gives the beggar a drop of Manna, because she begged so well.

The Beggar has not forgotten the art of living independently, but is absolutely dependent upon being fed by others. If kept in an artificial nest, these Ants will go, at first rather timidly, to get food from the bowl, to feed themselves. Ants are just like Men, and if their hosts permit it, they become chronic beggars, and make no effort to gain a livelihood independently.

Strictly speaking, every Ant is a beggar, each one asking her sister for food. It seems as though food tastes better to them, when it is given with a kiss. Only this begging food, this kissing and feeding, is strictly limited to their own people. Much as they love the mouth of a sister, so deeply do they hate that of every other Ant. The Narrow-chested Ant beggar is the only one in Antdom which can break this rule and get food from an alien. Her friendly host is the only one who gives food to a stranger that has its own nest and own brood.

Both peoples have broken with the ancient Ant tradition which sees an enemy in every alien. They live together peacefully and in friendly fashion. The host Ants of the Knotted Family consider the begging by the little Ants not an imposition, but actually enjoy being licked and give something of their surplus for this pleasure. They even make visits to the beggars, and since they can not pass through their narrow entrances, they batter down a wall to reach them. The beggars do not take this as an injury, but at once begin to lick the stranger who has come to them as a guest, and ask for a drop of food. Nevertheless they do not like these visits. They consider their own homes private, and try by gentle pushing, and catching the visitors by the legs, to get them out. When they have succeeded they rebuild the broken wall at once.

The Narrow-breasted Ants even learn to give up the ambition of the Ant to have its own home and rear its own brood, when this is necessary. If, in an artificial nest, no earth is given them, they set aside the possibility of building a nest for themselves, and surrender their independence entirely. They then permit their hosts to take care of their eggs and larvæ with their own and bring the two broods up together. Both peoples, although of different races, live together in a mixed state, in which only the sexual activities are kept apart.

* * *

A melting together of two Ant people in an artificial nest, even of other species than these, has been brought about without great pains; but there is never any blood mixture. Among Men, when one people is blended with another, when the Franks and Burgundians mixed with the Gallic-Keltic and Romanesque peoples, or the Angles, Saxons and Normans with the Picts, Gaels and Scotch, in the course of centuries a general blending of blood took place. The reason is that in thousands and millions of cases, there is intermarriage between individuals, which is quite possible for Men, but not for Ants. Among Men all are sexual, but among Ants the sexed individuals are limited. Moreover, among Men a woman may bear only a limited number of progeny, but the Ant Queen may give birth to a gigantic number of descendants; for she is the bearer of the Folk-consciousness, and the males, at the time of the hymeneal flight, mate only with their own or closely allied species. We Men have reared Mules for ages, and Hagenbeck managed to cross the Lion and Tiger and rear the offspring, but no expert with Ants has been able to cross the male and female of different species. They have no such thing as a mixed people. In a mixed population living together, such as the Blood Red and the Red-bearded Ants, every individual belongs directly to one or the other race.

Moreover, we must distrust the experiments made in artificial nests. Every student of animal life knows that in captivity all animals seem to set aside their original instincts. The Ants are no exception to this rule. All of the experiments in artificial nests are mere games; interesting, ingenious games, but never to be taken seriously. That should not be forgotten. Experiments under natural conditions are to be preferred to those made in artificial nests—the conclusions drawn thence are of far greater force.

We have seen how a people usually is founded in Antdom. The young Queen, fertilized by several males during the hymeneal flight, digs a hole in the earth, loses her wings, lays eggs, and rears her first brood; in some instances she plants and lays out a mushroom garden, which serves as the support of her numerous people. The young Queen is indeed a remarkably independent creature, who does tremendous work, for a long time, often without food. When her first children are grown, all workers, the hole is opened to the outer world and food is brought in. From this time forward the office of the Queen-Mother is exclusively that of egg-laying, which she develops to great efficiency. But this independent creature of yesterday has become very dependent. She is fed by her daughters, kept clean, and cared for, and nest-building, rearing the brood, gathering food and everything else is now attended to by the workers.

Two instinct-groups govern the Queen-Mother. One impels her to the effort of rearing a people, free, unaided, through her own indefatigable labor; the other urges her to devote all her power to egg-laying, so as to have as numerous a people as possible. In order to devote herself to the latter service, she permits herself to become most dependent for service, care and food.

When the instinctive cognition, that it is more profitable for her activity as future mother of a powerful people to get alien help from the very beginning, dominates that first, simple instinctive impulse to care for all herself, the fertilized female will seek other help as early as possible. On the other side, the inherited instinct will be awakened in the sexless workers; they know that the fructified female will increase the might of her people by laying eggs, and that she will do this the better if she is relieved of all other labor or care.

Through this instinct a number of the more highly developed species of Ants have learned the value of establishing other Queens besides the Mother—the real Queen. For this purpose they take females either of their own people, who did not wait for the hymeneal flight, and were fertilized by their own brothers, in the nest, or females of another people—but always of the same species—which are captured after the wedding and taken into their nest. At the same time the wings of these Deputy Queens are clipped. They are taken into the queen-chamber, cared for and fed, so that they may help the growth of the people by their egg-laying. Each one of these Deputy Queens probably would have been able to found her own people through her own hard labor, if left alone, but they seem to be quite willing now to let the workers wait upon them. The second group-instinct to devote herself to laying eggs, surrendering her independence for that, has overcome the original instinct.

Some species of Ants have suppressed the first intinct so completely that their sexed creatures can found their people only if helped by others. There are several possibilities now for the fructified female: she may be taken up by workers of her own species, or those of another people, or she may join a young, strange but industrious Queen, live with her and rear her brood with hers. Only in the last instance are the people blended, living in lasting union, which shows itself not only in the workers, but also in the males and females.

If the fructified female has been taken up by her own people or another people of the same species as a Deputy Queen, her progeny aids in the upbuilding of the people taking her in. If she be adopted by a people of her own species, in which the Queen is lacking, when the fated death of the workers takes place, the Queen and Mother rears her own brood. The same takes place if the fructified female has been adopted by a people of a different species; only for a time does the state appear mixed. Upon the adoption there are workers of one species and a Queen of a different kind; one after the other the workers die, and all that grow up belong to the species of the Queen, until finally it is a pure people of her species. It is not so easy to find a queenless people quickly. To become the head of a strange people, she must dethrone the Queen and place herself in her stead. The future mother does not hesitate to turn the trick.

If the young Queens follow their primitive instinct to rear their own brood, they face a long period of hard labor and endurance. If they follow the other instinct which has developed later, of utilizing the help of others, they do so at the imminent risk of their lives. Nevertheless, this method has been adopted by some species, as in the case of the flourishing Red Wood Ants and Meadow Ants.

* * *

The young Red-frocked Wood Queen must have been born on Sunday, for immediately after her wedding she is adopted by her relatives. The people whence she comes is mighty and numerous. The original mother-city has founded many daughter-cities throughout the entire forest domain, and all the citizens are considered daughters of a great people. Thus may the young princess enter one of these cities as Deputy Queen, or may rule as sole Queen over a new founded state.

It is much more dangerous when the hymeneal flight has borne them beyond the borders of their own forest. There Red Wood Ants live too, but they belong to another people. The young Queen must knock at the door of a stranger. It is quite probable that she will meet ill-natured workers who see none but foes in any one of other peoples, and she may be slain forthwith. On the other hand, the most beautiful dream of all Wood Ants is the blossoming power of their people, and all of them know that a young Queen can help. Thus she has good prospects, after some hesitation, of being accepted as Deputy Queen.

The prospects are poor for the Wood Ant Queen who finds no Wood Ant State. She must do something, and so she comes finally to a city of the Dark Gray Ants. As a rule, after the hymeneal flight, every female that accidentally falls into a strange nest is set upon and torn to pieces. In a populous city that is infallibly the case. But this danger must be faced by the young Queen, and she must try to transform the inimical swarm of Ants of a strange race into friends very speedily. She does so by being very modest and peaceful; returning good for evil. She allows them to pull at her and beat her most patiently. She draws back quickly at a shower bath of formic acid spurted at her. She strokes her assailants, and feeds them, if she gets a chance. In a word, she tries in every way to flatter them. This frequently happens when the Wood Ant Queen approaches the Dark Gray Ants.

Some experts hold that in most of these instances the young Queen has found a motherless people, or has been taken up by some wandering body of Ants. I am of a quite different opinion. It is not so easy to find a people without a Queen. In the first place all the Queens live for an astonishingly long time, during which the workers do their best to increase the power, number and longevity of their people by developing Deputy Queens. I am rather of the opinion that the young, fertilized female is not shy about entering a city in which there is already a Queen. She must try her luck. Her prospect of remaining alive, in order to found a people, is by no means certain.

What happens then to the Queen of the people visited? In no case may she remain alive very long, for otherwise we would have a blended state in which all types of both species would occur. The fact is that we find all types only of the race of the younger Queen, and of the other species only the older workers. It is possible that the old Queen is quite old, and no longer well fitted for egg-laying; dying soon thereafter. It is also possible that the workers, her own daughters, neglect her, and that she dies for lack of care and food. It would be a reversal of the natural instinct but such aberrations do occur in Antdom, as well as among men; with this difference, that among men only individuals are affected, seldom entire groups, but with the Ants, which are so highly socialized and moved by a common sentiment, entire peoples are affected. In Antdom we see the reversal of the original instinct in the dangerous affection which they manifest towards alien guests, the golden-haired Beetles.

Thus it is very possible that the stranger Ants who accept the new young Queen lose all feeling for their own mother, that they allow her to starve, even permit her to be driven from the nest or kill her themselves. Not only the Red Wood Ants, but also our Hairy Garden Ants found their states in this fashion. It seems to be more proper and honorable, from a human point of view, if the young Queen, which dethrones the old one, does not leave her execution to her own daughters, but takes her life when she takes her throne. This is precisely what the Regicide Ants do.

The Miner Ants as well as the Scamp Ants belong to the Long-necked Ants. These Scamp Ants are a real mob; in all their doings they are different from all decent Ants. They do not dig; they simply build hollow domes on the meadows, the blades of grass and other plants serving as supporting columns. They have very few chambers, sometimes none at all; then they simply lay their brood on leaves or blades of grass inside the earth-dome. They know nothing of the division of labor, winged males and females sharing the work with the rest; they even aid in removing to a new nest—something against all Ant custom—even in the carrying of the brood. More than this, these slovenly creatures laugh at the seriousness of a removal, taking it as a good opportunity for playing at love-making. A lusty male may all at once leap upon a female, if she stops while they are traveling; then he rides on, clinging close, to the new nest, each of them carrying a larva. At times the Scamp Ants stop cattle—no real cow, but at best a lean goat—just as they happen to come in the way of the Scamp mob. These are not fat, well nourished Leaf-lice, but only little Lightning Bugs. The little fools are quick and nimble. They stand up to fight, and the Ants seize them. True, they do not bite, but they do sting; they turn around and spurt the poison into the eyes of the enemy. This poison, however, is their best part. Unpleasant as it is to the foe, it smells aromatic and fragrant to man. They eat all the carrion they find; they are the real hyenas of the battlefield. Wherever a battle takes place between large, strong Ants, the Scamp Ants are sure to be found; and they jump upon the wounded and the dead alike in their foul work.

The young female of the Miner Ants takes her hymeneal flight like other female Ants. After the brief hours of love-making, she finds herself facing the crude, dangerous actuality of life. Listless and weary, false, moody, but of untameable courage, like the Frankish women of Merovingian blood, she looks around to find a nest of the Scamp mob. She does not enter, but strides around outside until she has attracted the attention of a few

Scamp Ants, which catch her and make her prisoner. To be taken prisoner among Ants means death of the worst kind; torn to bits alive. The young Queen faces all this. She does not resist, but allows herself to be dragged into the nest by legs and feelers. Even inside she replies to all the abuse with patient, infinite friendliness, stroking and licking her enemies, even trying to feed them. Meanwhile she is trying her best to reach their young brood as quickly as possible, and seats herself upon the eggs and larvæ of the Scamp Ants. It is almost as if this place were a safe free state; at least the Ants are no longer excited, perhaps puzzled by the remarkable forbearance of the stranger, who replied to all the hate only with friendly acts. There is one other spot in the Ant-nest which seems even safer, because holier: that is the back of the old Mother-Queen. The Miner female climbs up on her; strokes her and licks her; puts her mandibles tight around her neck. The Ants feel that she must be a good, true, fine creature to love their Queen so dearly. Although she is a stranger, she must be a very good friend. Slowly their hatred towards her is transformed into love. The good friend meanwhile sits quietly on the back of the old Queen; for one hour; for many hours. Her tender pressure on the Queen's neck with those hard mandibles becomes tighter and tighter; in the friendliest possible way, as gently as possible, slowly she saws her head off.

The old Queen dies, falls lifeless. The executioner slowly rises. The Queen is dead! Long live the Queen! The betrayed people of the Scamp Ants give the ancient throne to the murderess; acknowledge her as the rightful successor.

Now her rule begins. She lays her eggs and rears her brood. The Scamp Ants die out from day to day: the Miner Ant is sole ruler over her own people. The young Miner Queen is not the only one who secures her realm by murder. It has been established beyond any doubt that this method of cutting off the head of the reigning Queen in order to succeed her is practiced by other species. Gruesome? It certainly is. But we humans have no right to throw any stones. Has it not been considered for thousands of years the safest way for any pretender to ascend the throne—to murder the old king? Brothers have murdered their brothers; sons and daughters their mother and father; or sometimes, for a change, a distrustful father has committed the murders upon the pretenders. The young throne-stealer among the Ants only murders a stranger; murders the Queen of a race, that she hates with all her heart. There is a difference, but it is hardly on the side of Man.

CHAPTER XII

MASTERS AND SLAVES

If eggs, larvæ or pupæ of any species are placed outside an Ant nest of any other species, they are at once taken into the nest and devoured. About the only Ants that refuse this food are the Mushroom Growers, which are absolute vegetarians. Owing to their indefatigable industry and highly specialized division of labor, most of the Ant Peoples live in great abundance; they have more food than they can consume. Thus it happens that they can not consume a part of the brood laid at their door, even though they might like to. These die for lack of care and are cast upon the rubbish heap. Yet sometimes larvæ of a related species are fed and reared. We find strange individuals in states where they are treated as citizens and seem to consider themselves in the same light. An American feminine investigator has reported some results along this line. She found that the Ants treated as brother and sister the Ants which, though of a different species, had grown up with them in their nest, though otherwise they would have been regarded as enemies and treated accordingly. This applies, however, only to workers. Similarly, Hagenbeck has succeeded in cultivating friendships between animals of various kinds in his zoölogical garden.

These artificial communities can hardly be considered real peoples. The individual animals may develop a feeling of social attachment, but there is certainly no national consciousness. Under natural conditions there seems to be some obstacle to a blending of two Ant Peoples into a cohesive unity. Even when living together the two Ant Peoples manifest variations in building, and other habits, and after a short time, only one species appears with all three castes, while in other species one or the other type is lacking.

* * *

It is quite a common occurrence for a race of Ants to invade a strange nest, and steal its brood to serve as food. The Wandering Ants never pass a nest without cleaning it out. But the Slave-holding Ants seek also something more from the pupæ of the strangers. They want future help for making their state more powerful. Mankind knows slavery in various forms. Among almost all human races there was a time when it was the universal custom that every one captured in war became a slave. We have had nations among whom slavery was a temporary custom, while others have practiced slavery as a permanent institution. Among some only the state owned the slaves; in others the citizens owned the slaves. In the Russia of Peter the Great every single Russian was the slave of the White Czar, who might dispose of their lives according to his humor. In ancient Rome the slave was considered outside human society. Juvenal asks: "Is Alberner, the slave, human?" Naturally slaves were treated most cruelly; in other times and among other nations they wore out a miserable existence, although sometimes they were considered members of the family, as among the Turks, where they occasionally married the daughter of the house. A horrible confusion everywhere!

Among the Ants, during thousands of centuries the institution of slavery has developed directly, upon very solid grounds. Slavery applies solely to the worker-type. Individual slaves die without any progeny. Fresh slaves are reared from the stolen pupæ of strange peoples, and are also born to slavery. Only Queens make adult Ants into slaves. The treatment of slaves is important. They are not considered less valuable creatures, but as citizens of the great national family with equal rights. Some slaveholding species of Ants have made slavery a permanent institution. Others only hold slaves temporarily and can get along without them. Among the latter are the Blood Red Ants of Central Europe, having some near relatives in America.

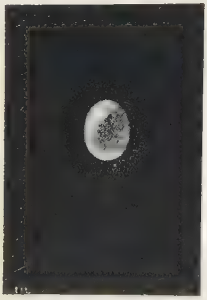
It is especially notable when old "Aunty Science" gives a name that fits halfway, as it does in

Ant with Mite on Chin.

Two Mites on Ant's Head.

A Rare Yellow Ant and large Red Mite.

A full grown Larva of the Argentine Ant. (Greatly enlarged.)



An Egg of the Argentine Ant. (Greatly enlarged.)

this case. The hinder part of the body is black, but the color of the front part may well be called blood red. I would prefer to call them the Monte-Carlo, or Roulette Ants, because we associate these words with "Red and Black," but I am merely a layman and do not count in learned circles. So let the Blood Red Ant remain such, in all languages, for all time, so far as I am concerned.

The female of the Blood Reds flies out of the city for her bridal. She finds a male, blood red as herself, and marries him. She bids him a tender farewell, and marries for a second, a third, a fourth time in quick succession. These Blood Red ladies agree with Mephisto, when he said: *"Women*—for I think of woman only in the plural." The Blood Red brides think of man only in the plural.

Yet we have no right to blame her for lack of faithfulness. It is true that human brides are true to their first loves for at least a little longer time, but they have not to consider a brief hour of love, and then three lustra, fifteen years or more, of fourfold widowhood, and nothing to do but lay eggs. The dream of love is past. That fluttering bride is now a woman in dead earnest who has broken with her past and lives only for the future. The wings—symbol of the bride, symbol of the flight towards love, of that oblivious joy under blue skies—are gone forever. That is all over now. Away with it! The wings are superfluous in the struggle for life. She feels the urge towards the task of becoming the Mother-Queen of a great people, and she devotes herself to this fine purpose. Full of vital force, she advances towards her aim.

She knows that in the great city from which she came, besides her mother, the Queen, besides her winged brothers and winged and wingless sisters, there was an entire series of other wingless ones, darker and smaller than they. Dear creatures, industrious, hard-working, always ready to help, when needed, well thought of by all. But there was a difference. When their Blood Red sisters went out on a robbery expedition these Dark Grays did not go with them, but remained at home, caring for and feeding the brood. Not as if some of the sisters could not do it—the Blood Reds never avoid any task—but the Dark Grays were skilled nurses, and besides, they were master-builders. If only help like this were obtainable, it would be easy to found a city and rear a brood.

The Dark Grays have their cities all over the forest. How would it be to find one of them? The young Queen goes on her quest. Soon she finds one of these nests, stuck away beneath some moss. She sees the castle, but there is a great swarm around it. She stops, undecided. How can she get in? Along come a couple of Dark Grays, apparently citizens of this populous city. They are an accustomed sight to her. They look just like her friends at home. She goes to meet them.

These Dark Grays do not act in a friendly way; they are even inimical in their attitude; but she is not afraid of them. She belongs to the master race. She will soon finish with these two—but how about that infinite number there around the mighty city? The Gray-frocked Ants run to their city. The young Queen turns away, seeking another path through the forest. Possibly she can find some city that is not so well populated.

She travels on and as she travels she is thinking. She remembers the tales which her sisters, the workers, told her and which came from her mother, the old Queen. Some of them were from her mother's own experience; others the latter had heard as a child told by her royal mother. There was a long legend and tradition of the proud race of the Blood Reds. Once upon a time there was a young Queen, so ran the tales, who went forth to found a people. She came to a great city of the Dark Grays, and though she fought courageously, she was torn to pieces. Another one saw this, went on and found a small town; here there lived a weak, impoverished people of the Dark Grays, who no longer had even a Queen. The young Queen took possession and reared her brood. Small peoples should be searched for, if a people is to be founded. Thus far the teaching of the Blood Red tradition. One generation tells it to the next; all know it.

Poetic exaggeration! Anthropomorphic folly!

No Ant-mother ever told her daughters any tales! Only instinct for the search had been inherited! So far as I am concerned, it is far more miraculous, Ye Sages! I can easily understand how they might tell the stories, but the inheritance of complicated instincts, to solve a problem like this, I can understand quite as little as you. But the basis is quite the same: inherited wisdom, which none of us can explain. I have given a simple picture; a metaphor, if you will, which makes the process plain; but you pedants give us a meaningless word, a hollow sounding phrase. The Young Queen travels through the forest and ponders the ancient tales. She hastens past the large cities of the Dark Grays; she is weary as evening falls. Then suddenly she sees, in front of her, a small town. A few Ants are coming home from their long journey. Slowly she follows the last of these; slowly, the young Queen enters through the open door.

But she is alone only for a moment. At once there is a swarm of Dark Grays around her. The young Queen tries once more with all the friendliness of which she is possessed, greeting the strange Ants as friends, stroking them, feeding them with kisses out of her full crop, but none will come close to her; all hold back distrustfully. She goes deeper into the strange city. One of the Ants attacks her, catching hold of her leg. Another follows, trying to get hold of her feelers. The Blood Red notes everything. It means a fight; a fight to the death. She does not hesitate long; she opens her powerful jaws, seizes them, lifts her hinder body and squirts a shower of formic acid over her foes.

The battle is brief. Those who attacked her lie dead on the ground. Their sisters, terror-stricken, too timid to help them, flee. Slowly the young Queen follows them. Her courage grows. If all the Gray frocks do not come at once she has naught to fear in this city. Through chambers and passages, a little different from home, she finds her way. Again she is attacked, but the assailant pays for her hardihood with her life. The Queen hastens onward to the nursery.

She is stirred by strange feelings, unusually mixed. There is a young brood to be reared. She feels the desire to see how the young grow until they are taken from their pupal cradles. Young brood of the Dark Grays—they may be eaten if we are hungry, that is an ancient rule among the Blood Reds. Then, stronger than this feeling, another sentiment; if she brings up this brood she will have all the helpers she requires. She will have Dark Gray servants, who will be her friends. She does not need all those others that hate her.

Her resolve is taken: she will have this brood. Two more Ants oppose her. They know what the Blood Red Ant wants—for the Dark Grays have their traditions also. They teach: "Look out for the Blood Red Ants! They are blood-thirsty robbers, who steal the brood." Once more the fight begins; she slays three enemies and the others run away. Now she is mistress of the nursery, and the proud victor at once becomes the solicitous nurse. She licks the young ones and cares for them. She is very tired, for it has been a long, hard day. She flew out into the air—how long ago that was! She still has her wings. . . . That endless journey through the forest . . . and the battles here in the strange city. She is very weary.

She hears a noise. Look, Dark Gray Ants taking their brood away, right before her eyes! In a flash she is upon them; another moment and three, four, lie in convulsions. But the others have carried away some of the larvæ and pupæ meanwhile. They stole them—for the young Queen considers them her own property. She decides to keep watch. Sitting over the brood, she guards them well, looking in every direction. Worn out at last she falls asleep. She does not sleep long, but she feels greatly refreshed after her slumber. She considers: what if the Dark Grays had caught her? A dozen or more while she was asleep? What luck that they are such cowards. But they have utilized the time to advantage; more than half of the brood has been taken away.

Now the young Queen stands proudly. She stalks along with the royal stride of the Blood Reds, dancing as she puts one foot before the other, like a noble steed of Arabian blood, walking Spanish fashion. She dances back and forth, as she considers. At last she is resolved: these Gray-frocked Ants are worthless, cowardly thieves, who steal my brood! They must be killed; one after the other; all of them! I must slay every one. Then only shall I be able to live at peace in my city.

She goes about her task. Wherever she meets a Dark Gray Ant she seizes it. Her lust for battle and thirst for blood grows stronger with each fight. A great terror falls upon all the citizens; hardly one dares to show herself. But wherever the Queen finds larvæ and pupæ, she picks them up, and brings them into the nursery. The battle has lasted for several days. She is but one and the Dark Grays are many. If only they had the courage to battle with her! They have by no means lost the love for their brood; they are always stealing some of them behind the back of the Blood Red Queen.

On her murderous trip through the chambers of the city, it happens that the young Queen comes to a chamber that she had not discovered before. Two of the Ants face her in battle, with the usual result. She enters the chamber, where the old Queen of the Dark Grays is reposing, surrounded by her workers. Now at last comes a battle royal. The presence of their mother seems to inspire them with courage, for half a dozen leap forward to meet the invader. She knows that she must conquer or die; she does not give a step, but battles with all six at once. And at the end she stands as victor. The others flee; she drives all of them forth.

It is strangely still in the little city. The young Queen finds one more of the Dark Grays every now and then, and kills her. If she is hungry, she picks up one of the larvæ and satisfies her need, but she cares for, cleans and feeds the others. She pays special attention to the pupæ, as she knows that very soon her servants will creep out to help her. The young ones can not get out of the cocoon alone, so she helps them, holding them as she bites a hole so that the young one can creep forth. One comes out, then another; soon there are a dozen of them, that help in taking care of the brood. More of the larvæ enter the pupal stage; more Ants creep out of the cocoons. Soon there is a people of a couple of hundred young Dark Gray Ants around her and all of them look up to her as their Mother and Queen.

Now her labor is complete. Now she may enjoy her repose, cleanse herself and let them feed her, while she lays eggs—an infinite number of eggs. All the other labor is entrusted to the serving people. Somewhere else in the royal hall, alone and deserted, uncared for and unfed, lies the old Queen. The young Queen, the Blood Red Ant, who has captured her city by force of arms, does not concern herself about her. She has more important things to do. She must lay eggs, must found a people, a great, mighty Blood Red People. But the daughters of the old Queen find her. No spark of love for their Mother burns in their hearts. All their sentiment—dependence mixed with yearning, perhaps—belongs to the throne-stealer, who rescued them from their narrow prisons, the pupæ cradles, and helped them into the world, she alone is to them Queen and Mother. The old Queen no longer belongs in the nest, they think, so they force her out, living or dead; they care not.

The eggs of the young Queen become larvæ; the larvæ, pupæ; young Ants creep out of the puppæ. The Dark Grays are expert nurses, and the young brood is served most efficiently. Weeks pass into many months, and the number of the Blood Reds becomes greater from day to day. One after the other of the industrious Dark Grays dies until the day dawns when the Queen rules over her own people alone.

* * *

This is one way in which the fructified female of the Blood Reds may found her people. Others are possible, according to conditions. It is conceivable that she may be taken up by Blood Red workers, or that she finds a queenless people of the Dark Grays, and is welcomed peacefully as their Queen. It is conceivable that she enters a very populous city, is conquered and slain; or she may find a young, small people, and after preliminary battles win over some of the Dark Grays to support her. Then the others may flee the nest with the old Queen and some of the brood. She may so win over all of the Ants that they, completely blind, may slay or drive out their own mother. She may in her insatiable thirst for blood become the murderer of the old Queen, or drive her out of the nest with some of her followers; or she may, after the hymeneal flight, meet a Dark Gray Queen, win her over, so that they may bring up their broods together, and when the first Blood Reds are grown, drive out or slay the Dark Gray Queen.

All these, and possibly other suppositions are possible, even probable, depending upon circumstances. It is certainly false to lay down the life of Ants, or of any other creatures, so mechanically as it is presented in the solemn works of Natural Science. Herein lies the great superiority of every anthropomorphic presentation; here is the brilliant power of Peter Huber, who wrote a hundred and twenty years ago, of Fabre and Brehm, as compared with all the egotistic pedants of "Exact Science." We may admit that they sometimes make mistakes, or misunderstand some phenomenon, or that there are some half-truths; we may admit too that sometimes there are palpable errors, even nonsense; but the same thing is true of our solemn pedants. We have only to compare the first edition of any work on Ants by their scientific investigators with a second or a third issued twenty years later. There we shall find endless alterations, improvements, and sometimes entire chapters rewritten from the opposite point of view.

Science asks to be accepted literally, and so that we may attain pure truth we readers must swallow whatever is dry and wearisome. The anthropomorphic presentation is far more interesting, and it also attempts to present the results of the latest studies of the subject. It is well known that the so-called "Scientific" truth is very short-lived when it comes to details, and has to be corrected constantly, in the light of new discoveries. The fact is that the anthropomorphic works, so greatly despised by the scientists, really contain a larger body of truth and outlast the dry-as-dust products of the pedants. Nature will not permit herself to be kept in a strait-jacket; the more freely we approach her, the more apt are we to reach her innermost being.

* * *

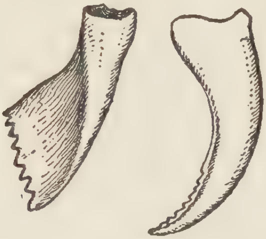
The Queen of the Blood Reds rests in her royal chamber, surrounded by her daughters, who feed and care for her. All the Dark Gray workers have died; only her own people are living in the city, becoming more numerous, more powerful daily. The city has extended its borders, her children are looking afar. They have taken from the pupæ-cradles not only workers, but also winged males and females for the founding of new peoples. They are growing fast. Soon that warm day in July approaches upon which all will fly forth for the wedding-feast in the open. The Queen is alone with her workers. The nest has become emptier. The provisions have been all consumed; the winged ones have been well fed that they might go forth into the world with full vigor.

The Blood Reds are hunters. On their hunting expeditions some of the workers have discovered an alien city and brought in an account of it. For the young workers know—a tradition from their mother—what may be secured from the other cities in the forest. Why not get some nurses like those Gray-frocked ones who reared them? And they decide to besiege the city and plunder it.

* * *

I have read many accounts of the warfare of the Blood Reds, when they go out on a plundering expedition. All these presentations show variations, but nevertheless each single one is true. I myself have observed a number of these warlike invasions both in Europe and America, and each one was different from all the others. Only the general purpose seems similar. In details the Blood Reds act according to circumstances, as they arise.

Sometimes they march in a serried phalanx several yards broad; sometimes in several divisions. Usually they leave their home early in the morning, so as to be back by noon; sometimes they remain away over night. Sometimes they engage in very hot bloody battles; sometimes they succeed by a sudden onslaught which frightens a cowardly foe into submission so that they run away, head over heels, and the Blood Reds do not need to slay one of them. It is all the same to them.



Mandibles of Blood Reds
and Slave Holders

The Blood Reds leave their city in straight lines, when they go against the foe. The Blood Reds have no officers, marching at the front, or hurrying along the line of march. Nevertheless they must have some leaders, or it would be inconceivable that this great mass should turn neither to right nor left, and march for a hundred yards or more over all obstacles. It is noticeable that the front line is constantly changing, and we get the impression that certain leaders, palpably the scouts who had brought the news of the city to be besieged, are hurrying down the lines, sometimes showing the way, at others hurrying laggards. When they march in separate divisions it seems as if the leaders were persuading one group of Ants after the other to take part in the expedition. Those that they win over first go forward; after a while another troop follows, and then the others, at brief intervals. Arrived at the alien nest they range themselves around it, but do not attack, waiting quietly to see what the foe will do. If they do not find themselves strong enough for the assault, they send messengers back for reënforcements.

Meanwhile the Dark Grays have taken note of the enemy's approach; themselves a numerous People they resolve not to flee, but to put up a defense. They issue forth in great swarms, standing in serried order of battle. The Blood Reds still remain passive. Little skirmishes take place, begun by the excited Dark Grays. Meanwhile some of them have brought out the young brood so that if they lose the battle they may break through and save what can be rescued. The young winged creatures halt with this division. The battle develops; the Dark Grays, outnumbering the foe, give the Blood Reds quite enough to do. Then comes a complication: led by a few females, a strong body of Gray-frocks, each laden with a larva or a pupa, tries to break through the line of the besiegers. The Blood Reds utilize this moment, centering their attack on this point. The Gray-frocks, with their children in their arms (or mouths rather) try to save themselves by climbing the blades of grass.

The Blood Reds swarm from all sides, attacking vigorously, while the Dark Grays sound the retreat. Their young are snatched from their jaws. Every Blood Red having taken her booty, hastens home proudly, and some of them take the booty from one another. They are only after the brood; they fight and slay only when a Dark Gray attacks or will not surrender its child willingly.

The Blood Reds swarm into the city, spreading in all directions, dragging out all of the brood that they can find. Some of them, much against their will, carry other booty home. Here a Dark Gray head hangs to a feeler, there half of a Dark Gray clings to a foreleg. Their enemies had bitten hard; even in death they hold fast. Every myrmecologist has a good collection of Ants and in all of them we find Blood Red warriors to which two, three, even four half-enemies are clinging. Home they go, heavily laden with living booty. May the Dark Grays gather again; may their Queen lay ever so many eggs; may they develop into a larger number of larvæ and pupæ than they counted before. The Blood Reds wish them all the prosperity in the world; for the sooner order is restored among the Gray-frocks, the sooner may they pay them another visit to get more precious booty.

Is it at all different with mankind? At most we demand that the sad-visaged Gray People besieged by the Blood Red victorious nation should carry their hardly earned treasures home, over and over again!

* * *

New nurseries in the city of the Blood Reds are filled with the stolen larvæ and pupæ, but these nurseries are not mere nurseries; they are store chambers of the future. The Blood Reds treat the strange brood kindly, feeding them to their hearts' content. It is true that a portion of the brood, especially of the pupæ, just about to slip out, are set to one side. They are cared for and helped out of the cocoon, and the Blood Reds rejoice when a host of Dark Grays creep out of their cradles, for they are the slaves who can render valuable and necessary service.

The Queen lies in her royal chamber laying eggs. She already knows that soon she will have dark servants, for she has eaten heartily of their sisters. She awaits the growing up of these Grayfrocks with yearning, recollecting her youth and her earlier queenly state when she feasted upon them. While lying around doing nothing but laying eggs it is good to have a change of diet. The Dark Gray slaves also know all about cattle-keeping. They issue from the city, milk the dear Leaf-lice and return home with full crops. To the Queen these milkmaids bring that delicious Manna, Honey-dew!

It is not as if she were to pass all her existence in the one chamber; not as if she were never to wander freely in the wide world through the mighty forest, and see the blue heavens and the glorious sun. That would not please her at all. She is a real Blood Red and the Blood Reds have an uneasy spirit and seek variety in life. They are proud creatures; exceptional beings who know what is due them.

A city for the summer; another for the winter! Not content with this, if they are displeased with the place in which they live, they begin and build a new city on some other site. All the Ants help, and the work progresses rapidly, but it is very good to have expert slaves, for they go in search of others like themselves as earth-workers. Sometimes the labor of building a new city is avoided by taking possession of a ready-made city and driving out its inhabitants. Brood, provisions and slaves are transferred thither. The Queen accompanies them, moving several times a year: for where she is, is the home.

* * *

The Blood Red People are very independent. Although each one of their Queens may have founded her people by the aid of alien slaves which she has reared, her state is by no means permanently pledged to slave-holding. Some states hold slaves only for a time, and others never have any. Many peoples have far more slaves than citizens, while in others the reverse is the case. Nor do they limit themselves to the cities of the Dark Grays as sources for securing the young brood for food or slaves; they avail themselves of the nests of all species. In Europe alone there are a dozen species from which the Blood Reds draw their slaves, chief among these being the Red-bearded, as well as the Red Wood Ants and the Wood-meadow Ants. Sometimes slaves of various species are found in their nests.

The Blood Reds are not always the conquerors; they do not always succeed in plundering a strange city. Sometimes the robbers return home with empty pockets, beaten off by the superior numbers of Meadow or Wood Ants. The Blood Reds know how to distinguish between the broods of various species. Their sworn foes are the Red-haired Garden Ants, whom they enjoy plundering most of all. These Red-haired Ants, courageous little creatures, seem all upset, and follow the Blood Reds as they return home laden with booty, hanging to their legs and feelers. Nevertheless the stolen brood is taken into the city and devoured bit by bit. The larvæ of the Red-haired Ants are never reared, apparently the Blood Reds deem these savage warriors unfitted for slavery.

* * *

Meanwhile all goes well with the Queen. She is doing her duty, laying eggs, and more eggs, and still more eggs. In winter, it is true, she rests a bit. It is cold outside, but she is in the solid winter-home. It is so frosty that no one feels like working. Besides, what game is abroad? No Ant-prey runs around in the snow. The best thing to do is to remain quiet and doze away. Only the most necessary work is done; little is consumed, for most of the time they sleep, the Queen and her people, dreaming of power and fame.

When the young Lenten sun kisses the forest again all awaken to new life! She is assiduously cared for. Her daughters bring her fine food of all kinds, and the Gray slaves bring the honey-dew. She has some more slaves now, Red-bearded Ants, who are no less attentive. Her people have become more mighty. They have founded a dozen daughter colonies, and adopted vice-Queens who must now help lay eggs.

However, the life of the Queen is not always filled with good fortune, for sometimes there is bad news. Her Majesty the Queen desires to enjoy the sun—Queens are that way. Of course it is not in the royal chamber; egg-laying can be done better in the dark. She desires the sun for her mighty people; she wants to hear only good news of the conquest and plundering of alien cities. They suppress unpleasant news—that is the way in all courts—but somehow, possibly through some talkative servant, the bad news reaches her; and her Royal Majesty worries, gets a headache and has slave-state that the sexed members of the masters only are reared, and never those of the slaves.

It seems never to have occurred to these learned gentlemen that side by side with the master-instinct there is a slave-instinct—but that belongs in another department, that of sexual psychology, and no real scientist bothers himself about what is taught in some other neighboring room. We certainly see this slave-desire in our Dogs, daily, and every one who has eyes to see life whole, must have met other Men, who were born slaves, to whom the wish to be called slaves and to be slaves alone was pleasing. But what does a myrmecologist know? Even here the resemblance between Men and Ants is very striking, only in the Ants which have developed so high a social and national consciousness, the slave-instinct, like the master-instinct, has become deeply rooted. If then we call Men who help by the name of slaves, we have all the more reason to term the helping Ants the same.

* * *

Still the old Queen lies in her chamber laying eggs. She has seen several generations of her daughters grow up and die, seen many slaves come and then disappear. She never bemoans the death of one of them. One Ant is nothing at all; only the people counts. Thus her love is poured out neither upon one or the other; only upon all her people. But now she feels some heavy cares.

A couple of Dark Gray Queens had been found hidden very close to her city. The Red-bearded slaves who found them, had made short work of them. But it had occurred again that one of these Gray-frocked Queens had come close to her city; had found some Dark Gray slaves and gone off with them. The thankless gangsters! Instead of being grateful for the privilege of living in the proud state of the Blood Reds under the rule of their mighty Queen, whom they had the honor of serving, this band had preferred their little Gray-frocked Queen, a mean good-for-nothing who had not even laid a single egg. It was very annoying, but there were still enough slaves in the city and others can be stolen and reared. She thinks no more about it.

Nor does she think of the thieving peoples that have appeared in her city. It is true indeed that they have been increasing considerably lately; and are becoming more and more insolent. Did not some of these loafers break into the nursery the other day, near by her royal chamber? And they had stolen everything before aid arrived! Her big, strong daughters can not get hold of the little, poisonous robbers, but it is a good thing that we have the Dark Grays and the Red-bearded slaves who are smaller and can deal with the robber-band more effectively.

But the old Queen has even worse troubles. There seems a pall impending over the entire city.

Golden-haired Fringed Beetles run through the streets, passing from one room to another. The Blood Reds seem possessed; they feed and care for the golden-haired witches, only that they may lick those hairs. There is an aromatic ether liquor, and this drink intoxicates them. Even the slaves share the desire for the intoxicant with their mistresses, contending with them for the Beetles. Lately one of these witches came even into the royal chamber, and her daughters and servants ran away from her to attend upon the golden-haired siren. One of them offered the Beetle a dainty bit of a larva with a kiss; another tendered a drop of Honey-dew—dainties intended for the Queen. They did these things even under her own eyes!

The Queen is neglected. Only one thought seems to animate the city: that of the golden-haired sirens, of their intoxicating etheric liquor. They are cared for, cleaned, licked, kissed and fed, and their brood is solicitously reared, but her brood is neglected, as well as the Queen. She saw unusual creatures creeping through her room. Half females, half workers, lazy, cowardly hermaphrodites, unfitted for life. Was that her flesh and blood, were these abortions her own daughters? Had the blinding power of intoxication, the oblivious love for the golden-haired sirens, the ancient inherited sin of the race of the Blood Reds, so far overcome them that they gave their own brood to the hungry brood of the Fringed Beetles, leaving such poor specimens of their once proud race to grow to maturity? The old Queen is hungry, she feels filthy. But who bothers about her, who is there to cleanse her, or to feed her? Where are her daughters, her servants, her slaves?

The old Queen is tired out. Is that the purport of life? Was it for this that she had become a murderess, forcing her way into the city of the Dark Grays, slaying all who opposed her will? Was it for this she had pushed the Queen of the Gray-frocks from her throne, and made her daughters her own slaves? Was it for this that she had reared a mighty people, laying eggs for months and long years to bring it about? Only for this? To see this great, brave, prosperous people, a people so brave and efficient, rush down to ruin in such paltry fashion? All for the sake of a pair of miserable Beetles with golden hair and an intoxicating liquor to offer? All for this? Was this the purpose and end of existence? The old Queen can not comprehend it. She lies down, to die. . . .

* * *

There are some Ants who know more about slavery than all the other Ant Peoples in the forest and field; for the other species know only one side: either they are masters, who steal, or slaves who are stolen. The Red Wood Ants and the Meadow Ants know slavery from both sides. Their young Queens found their state as mistresses, compelling the Dark Grays or the Red-bearded of a strange city to allow themselves to be reared in friendly fashion. Or they do it by force, for they are courageous and warlike, notwithstanding their small size. The first brood of the young Queens are reared by stranger slaves, and with these slaves the Queens arrange house and state with their first daughters. With them they build the nest, and with them they go forth to gather food, and see to the work of nursing in the nurseries.

The stranger servants die out slowly. Then the Wood Ants and Meadow Ants are all of their own race. They do not pursue slavery any further. If they get an opportunity to steal the larvæ or pupæ of strangers they do so, of course, but only as an addition to their bill of fare, never to rear them. In battle they hold their own splendidly, defending their cities against the Blood Reds and the Amazons. Some of the sieges they repel successfully, but at times they are beaten by the more powerful foe. The city is taken over, the young brood is taken away; those that are not devoured are brought up as slaves by the slave-hunters.

And sisters of Ants, that once were reared as mistresses of slaves are now reared as slaves themselves; trusted nurses for the children of their mistresses! Ant fate! Is this not also the fate of Man? Many a princely son has been chained to the oar of a galley; many a king's daughter shut up in a harem, could have sung the same song!

CHAPTER XIII

THE AMAZONS

Science calls this race of the Ants *polyergus,* the "Hard Working," probably because they never work; only wage war and primp. The Amazon Ants are unfit for any other kind of work, because they lack something that is needed for labor. This science calls the "chewing edge," for the very excellent reason that other Ants do everything else but chew with it; they dig, build, plaster and perform all kinds of work with it. It is as if we called our hand a smelling proboscis, or our little finger an organ of vision; it is certainly a joke!

The Chewing Edge is the toothed inner edge of the upper jaw. In the Amazon Ant this inner edge, though toothed, is so slightly indented that the teeth are visible only under a microscope. Moreover, the upper jaws are like long, mutually opposed, very pointed, powerful sickles. They are frightful weapons, but are unfit for anything else than fighting.

As a consequence the Amazons are absolutely dependent upon the help of slaves for everything all their life long, with the one exception of battle. In Antdom they are the slave-hunters *par excellence,* their entire state being built upon the holding of hosts of slaves. It is inconceivable to me how any one can speak of equality between them and their slaves. When their mistresses go on the warpath, the slaves remain at home; all work being left to them. They build the nest, take care of the Queen-Mother and the brood of the Amazons, as well as of the stolen brood.

They care for the food supply of all, even feeding the Amazons, which have lost the art of feeding themselves independently. The Amazons are absolutely dependent on their slaves, but they have the strength and power to secure the aid of a countless number of these slaves. They know, too, how to preserve the respect of these slaves. At times the work of feeding their mistresses seems too much to them; that is when they have nothing left in their crops. Then they would like, instead of offering a drop of food to a mistress, to refuse to serve them, just as some of our cooks who get angry and lead the mistress of the house a merry dance. The human mistress is often glad to come out of the kitchen alive, after telling the saucy servant what she thinks. The Amazon mistress is not so easy; she pierces the head of the rebel with her sharp sickle.

In Eurasia and America, the Amazons recruit their slaves from the same species from which the Blood Reds get their slaves, chiefly from the Dark Grays, the Red-bearded, and the Ashen Peoples. The need of slaves by the Amazons is incomparably greater; the more there are of them, the better. States have been found in which there were fifteen times as many slaves as Amazons.

* * *

When the young Amazon Queen issues forth to found a state she behaves much like the bride of the Blood Reds. She too looks for a city of the Dark Grays, the Red-bearded, or some other species adapted to slavery. But the Amazon Queen can not rear any brood, either her own or any other. Possibly she finds a queenless people and is accepted. All the Ants know and fear the terrible sickle-weapons of the Amazon. If she merely opens her jaws, they are thrown into a panic. But it is no easier for her than for the Blood Red to find a queenless city, and she requires a large number of slaves to rear and feed her brood and wait upon her. She does not wish to have a battle with the workers, for every one of these that she kills means one less slave. Therefore she bears patiently the pulling and tugging of the strangers, contenting herself with opening her jaws threateningly if they become too rough. If they go too far, she kills one forthright.

She tries to get into the royal chamber as quickly as possible, and pledges her friendship to their Queen. How she succeeds in getting into her good graces is beyond human understanding, but that she does so is beyond question. The workers when they see that their Mother and Queen has received the stranger in amity and friendship, alter their attitude towards her, and one after the other, make friends with her, and begin to feed and pet her as she sits there with the old Queen. This continues for a time, the workers becoming more and better accustomed to the stranger, until one fine morning they discover their own Queen dead and the Amazon mourning over her. Do the workers see that their mother's head is bored through by the terrible sickles? Or do they acknowledge the murderess as their Queen in their puzzled terror? Or do they not recognize this night's murder and only see in the new Queen the friend of their mother?

Be that as it may, the dead is taken away; the regicide becomes their ruler. She begins to lay eggs, and her brood is reared. A new Amazon People is founded. The brood of the dead Queen is reared at the same time, and in this way the number of the slaves is multiplied. The young Amazons are true princesses. They know no other pursuit than that of beautifying themselves. No woman of the world (or half-world) devotes so much time to her toilet as do these. Besides beautifying themselves, they have no time for anything else but scuffling. It is as if they were training themselves for their future career as warriors.

The warlike expeditions of the Amazons are very frequent. While the Blood Reds undertake only

The Coushies or Leaf-Cutters, taking home Leaves for the Mushroom Garden.

occasional raids, often only once or twice a year, during the Summer season, the Amazons often go out twice a day. Spies are sent out in advance, singly or in small bands. When these spies have found a strange nest, they examine it carefully to find all of the entrances, so that they may be sure how they may capture the city most easily.

It is most thrilling to watch one of these warlike expeditions of the Amazons. They gather about their nest in the early afternoon hours. They are beautiful creatures, if we may attribute beauty to Ants. Brownish-red females and workers, shading off into violet; the males a deep black, with white wings. If you want to know what Ants can do to you just try it out with an Amazon People. The Wicked Stinging Ants, the Wandering Ants, the Fire Ants, or the Bearded Mexican Harvest Ants do not exist in Germany, but it is easy to find Amazons. The Blood Reds take hold viciously and put to flight many curious boys; but the Amazons with their sharp sickle-daggers are adversaries for men, by no means to be underestimated.

The Amazons gather about their nest, highly excited and nervous, all talking to one another in the feeler-language of the Ants. The slaves run around, quite as excited as their mistresses. Sometimes it appears as if the slaves are trying to persuade the warriors to desist from their expedition, as they hold them around the body or legs, trying to drag them back into the nest. Something similar may be observed in many Ant species at the time of the hymeneal flight, when the winged sexed animals gather about the nest; then, too, the workers try to pull the males or females back into the nest.

What is the reason? No human being knows. I might suggest that the workers, the slaves in the Amazon state, do not consider the time propitious, perhaps from some sense of weather conditions. There are many animals, even some human beings, who can prophesy a change in the weather. I have been able to prove in connection with these attempts at restraint, both during the hymeneal flight and the war-expedition of the Amazons, that, as a matter of fact, shortly thereafter a storm sets in.

Another reason for delay may arise. Sometimes some of the workers try to persuade the army to go in one direction, while others take the greatest pains to urge them to go another way. These are the spies. Some found a nest in one place, the others found another nest elsewhere, and each party urges its own claim to consideration. Finally they decide to go towards the east and postpone the expedition to the west for another day.

The Amazon army gets in motion. The slaves never accompany them, but sometimes the winged females do. The reason for this certainly is that they want to learn all about the territory surrounding their city, and where they can find slave-races, information which they can utilize after the hymeneal flight for the founding of a new people. The females take no part in the assault; they leave the army, flying to right and left, to impress upon their memories the location of stranger nests. The Amazons are gifted with remarkable powers of memory. Not only do the spies lead the army of invasion in a straight line to the nest which they have found, but even members of the same people recognize one another after a long period of separation. In artificial nests, Amazons of the same group have been separated for a year and when brought together, recognize each other at once and greet each other in a most friendly way.

The shock-troops are closely serried. There are no real officers, but the spies are constantly running back and forth, aiding in directing the line of march. A few Amazons march on each side, seeming to have the duty of protecting the flanks; but they have nothing to do with leadership. In the line, sometimes the Amazons are seen to halt. They have something very important to do: beautify themselves. They throw themselves on their backs, for a few seconds; then they hasten forward. Notwithstanding these occasional interruptions, the Ants march very rapidly. It has been calculated that over a good road their marching time, in proportion to their size, is more rapid than the advance that can be made by men. They cover, in proportion, twenty-five miles an hour, not much less than man can cover in moving a large army, even with the aid of railway and automobiles. Besides, the warmer the weather, the more rapidly do they run along.

Arrived in front of the strange city, the Amazons come to a halt, just as the Blood Reds do. They do not wait, however, to see what the inhabitants of the city will do, but crowd into every entrance that had previously been spied out. It is as if a heavy brown liquid had gushed in. Even the Amazons do not attack at once, but first try the effect of the terror of their sudden invasion, hanging like a pall over the ill-fated city. Thus it sometimes occurs that in an incursion like this neither a friend nor a foe is killed or wounded. Bloody battles usually result, however. The Amazons catch hold of head, throat or breast of an enemy and bore it through with their sickles. In a few seconds the victim dies in convulsions. On the other side, the Red-bearded or Dark Gray Ants hang to their legs or feelers and spurt their poison, which costs the life of more than one Amazon. The Amazons seem to utilize their poison only in exceptional instances.

The Amazons issue forth from the alien nest, each one with a larva or a pupa in her jaws. They carry them very carefully, in order not to touch them with the points of their sickles, and each one hurries home independently. Arrived there, at the city gate, they entrust their booty to the slaves, who carry them inside; while they hasten back to the plundered city to get more booty, even covering the same road a third time. Meanwhile the conquered try to break their way out; laden with their brood, they hasten from their nest. The Amazons pursue them to take away their brood, clashing their sickles over the pupæ. Then the enemy often lets go of its burden, or the Amazon uses her frightful dagger, catching hold of the bearer's head. Even then they wait a moment, as if to give the foe a moment of grace, to make it let go of the pupa; and usually the threat works. If it does not, her head is bored through. Followed on all sides, the Amazons hasten homeward, heavily laden. Some who could not find a larva or a pupa, feeling that they must have some booty, have picked up a young worker, or even a full-grown one, and are carrying it along.

If an Ant is using her weapons for carrying, they are less useful for fighting. Sometimes it happens that on the way back, the enemies, five, or six or seven strong, may attack a single Amazon, at one time, holding to all her legs, in an attempt to recover some of the booty. Some of the prisoners also win back to freedom. We get the impression, almost, that the Amazons, after thinking it over, have come to the conclusion that prisoners are of no use, so they open their jaws and let them run away. Other prisoners, of course, are brought home and torn to pieces there. Some are not even taken away, but killed and devoured either in the plundered city or on the way back. Sometimes some of the Amazons are made prisoner; their enemies hanging to all their legs and tugging them along. Then we may see how another Amazon rushes to the rescue of the heavily beset sister and frees her. Finally, as the Amazons are much faster runners even when heavily laden, they shake off their pursuers.

The Amazons are not always victorious; for sometimes they attack a people too much their superior in numbers. The battles are waged in many ways. It is false to say that the Amazons fight instinctively according to a fixed plan. It sometimes happens that a handful of Amazons will put to flight a large army of the enemy by the very savagery and power of their attack; and it also happens that an apparently overpowering host of Amazons will hold back and send for reënforcements before proceeding further. Usually the retreat is without order, but if they are attacked vigorously by their pursuers, they form into serried ranks very quickly. It is impossible to be certain that there is any personal leadership guiding the onslaught. Rather does it seem that the Amazons, like the Blood Reds, in a lesser degree, have mastered the art of war perfectly, an impression which we never get from the battles of the Wandering Ants. The latter simply overflow everything with their mighty mass; work more like a deluge than like warriors on a battlefield.

The entire army of the Amazons never withdraws from the city; a strong guard always remains at home to control the slaves.

* * *

It happens sometimes that the spies sent out scouting for a city worth taking return without finding any. Then the Amazon People decide to go out on a chance. Gathered around the nest they seem to discuss the question in lively fashion, as to which direction seems best. Finally they agree and march ahead. Now all of the Amazons become scouts, running in different directions, stopping, looking every way. Sometimes they discover a strange city, and at others they return home empty-handed.

Very frequently they are attacked, while going on a raiding expedition, by Ants of all kinds. Every Ant hates the dangerous robbers. The most sanguinary battles are those between two Amazon armies. They become a mass of battlers, rolling one another in the dust.

Occasionally the Amazons do make peace. Some of the warriors, who understand clearly that they require slaves to bring them food, make an agreement with the Red Wood Ants. Inasmuch as they too are great fighters, a battle ensues in which some of the Reds lose their lives. But then they seem to come together, and it is the Amazons who appear to offer a peace agreement.

* * *

When at home these warriors are content to do nothing but beautify themselves. They cleanse themselves; brush, comb and anoint themselves—in a word, they are always finding new delight in making their toilet. Even when very busy with their robber-raids, only a few hours a day are devoted to these expeditions, and the plunder-season lasts only a few months in the year. The rest of the time they spend in pleasure, leaving all the work to their slaves, at most giving a few "beauty" lessons to the little Amazons which have just slipped out of their cocoons. They keep themselves in good condition with sport and games; their wrestling and boxing matches sometimes going so far as to result in the wounding or killing of one of the combatants.

They never go hunting, although they are well equipped for it with their great speed and sharp weapons. They only take the stolen brood home, for feeding the State; and the number of larvæ which a powerful Amazon People of a thousand may bring in during a single Summer is astounding, having been estimated as high as fifty thousand. Although only a small proportion of these are reared, the provision thus brought into the State by the Amazons is not to be underrated. The slaves must care for the securing of the food, going hunting and caring for the cattle. They have to do all of the building besides, for the Amazons do not concern themselves about it. When they move they do not even carry their slaves, as the Blood Reds do, but have the slaves carry them.

The entire brood is entrusted to the care of the slaves. In the first place they must rear the Amazon brood, males, females and warriors. Besides they rear all of the stolen brood that has not been devoured—but only the workers, never the sexed creatures. Feeding as well as care of the brood is exclusively the duty of the slaves. If an Amazon is hungry, she goes to the nearest slave, demanding food. This the slave offers from her crop stomach, Ant fashion. Of course the Amazons feed one another: but only with food lately received from some slave, which is still in the crop. The Amazon has almost, if not quite, abandoned the art of securing food for herself. True, she licks up any liquid she happens to find, or if she has stabbed an enemy Ant or picked up a larva awkwardly and killed it, with her sharp sickle-shaped mandibles, she laps up the blood, but this trifle of food is merely accidental and would never suffice to keep her alive. Thus, if we take away the slaves from the Amazons in an artificial nest, the latter will starve, even though abundant food be placed near them. If a few slaves be introduced into this nest of the starving Amazons, they will restore them to full vigor very quickly.

We are tempted to the conclusion that the Amazons going hungry, even with abundant food near them, have triumphed through their lack of intelligence, but this is quite wrong. We may easily perceive how it has happened that the Amazons have lost their instinct for independent feeding, in the course of thousands of centuries. In their robber-raids it is necessary to bring home the stolen brood as rapidly as possible; all temptation to devour them would be dangerous. Within the nest, however, *every* Ant is accustomed to ask the homecoming sisters for food. This mode of feeding would also be the most natural for the Amazons. The repeated experiment of allowing Amazons without slaves to go hungry in an artificial nest, must present a false picture, because the Amazons in the natural nest are never without slaves, always having a host of them ready to serve. The procedure of requiring food only from the mouth of another Ant, is quite as *intelligent* as putting food into your mouth yourself. This mode of feeding is to them the only natural way of getting food.

This "dependence for food" of the Amazons is to pedantic scientists a certain proof of degeneracy as well as of lack of intelligence in these creatures. We would have the same right to consider the intelligent Chinese woman, who binds her feet until she is crippled, as degenerate and unintelligent, because of her "dependence for walking and running." If in China they consider crippled feet in silk embroidered shoes exceedingly beautiful, and attach no value to running and jumping, and free movement, and there are servants to wait on the women, and in Amazondom it is the custom to get food only with a kiss, brought by a slave at a wink, may we not say that the Chinese and the Amazons are living their life, just as they wish to live? Possibly the pedants may term it unintelligent, but that does not make it so! Goethe understood this well;

> "If I can count six mighty chargers,
> Is not their power all mine own?
> I speed, yet still am I a man,
> As if I had four-and-twenty legs!"

CHAPTER XIV

EXCEPTIONAL SLAVE STATES

When slavery among mankind was taken for granted, there were various ways to slavery. Prisoners taken in war were enslaved, or some men went on slave-hunting expeditions. They went after slaves or bought them in the market. A man might be adjudged a slave by the courts, or a man might even sell himself into slavery. In Antdom we have already learned about those who adopted slavery, and went on slave-hunting raids. They illustrate one of the peculiarities differing from the human system in so far as entire peoples go on warlike expeditions to utilize these slaves for service and food as well. Only the brood is taken away, and slaves are reared from them. Besides this enslaving of alien peoples, we saw single creatures taking possession of slaves; young Queens, who risk everything themselves, even reducing adults to slavery.

But Antdom knows of other experiments. In northern Europe lives an Ant, called *Tomognathus sublævis,* a name to delight every scientific pedant! It means a Smooth Ant with narrow cutting mandibles. One glance through the microscope proves that this Ant is not at all smooth, but rough and very hairy, and that their mandibles are not narrow, but very broad; just the opposite of what their name would indicate. Fortunately they have lost this beautiful name lately, not because it was so stupid, but because some other unfortunate creature already bore this lovely appellative. Recently it has been called *Harpagoxenus,* that is "Robber-guest."

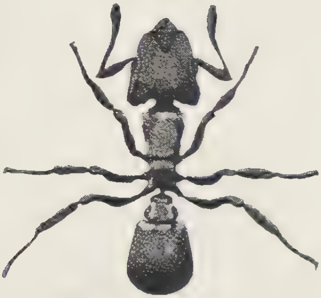
This Ant lives in small communities with another species somewhat related to it of the family of the Narrow-breasted Ants. The Robber Guests live something after this fashion: A small community of these Ants, either workers only, or with a young Queen, go out to rob a stranger nest. They drive out all that live there, inhabit the nest, and rear the brood of the strangers. This process is actually not as simple as it sounds. As a rule they are neither warlike nor brave, nor very well adapted for work; those attacked could easily have done with them. Nevertheless, it seems that among this Robber Guest People there are one or more individuals with the spirit of initiative, which the mass lacks. The strangers have a great terror of these super-Ants. In this way a single Robber Guest Ant may drive an entire people out of its nest—workers, Queen, even males. Then, only half-heartedly supported by her sisters, the efficient one cares for the rearing of the slave brood. As soon as this brood is grown, it sees to the feeding and care of the brood of the entire Robber Guest People.

Now, however, not only are the workers of the slave species reared, as in other slave states, but they also rear the females and the males. Soon a Queen of the slave-race also appears in the nest, which was fructified by her brothers in the nest or was brought into the nest from outside by the slave-workers. The Robber Guest Ants do the same thing, in case they have no Queen of their own in the slave-nest: they go in search of a fructified female after her wedding and bring her into the nest.

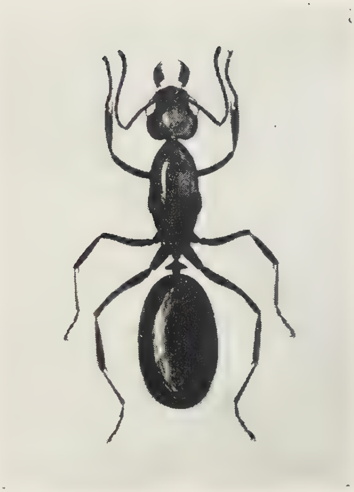
A hunt for slaves from a stranger brood may take place at any time, so that it occurs that we find in a nest of the Robber Guests two different species of slaves, the second being only workers, which could come thither only by robbing the brood and taking it to this nest.

The Robber Guests have all three types of the slave people in their nest. The Slave Queen has to provide a succession of slaves. Here lies the closest resemblance between slavery among Ants and man.

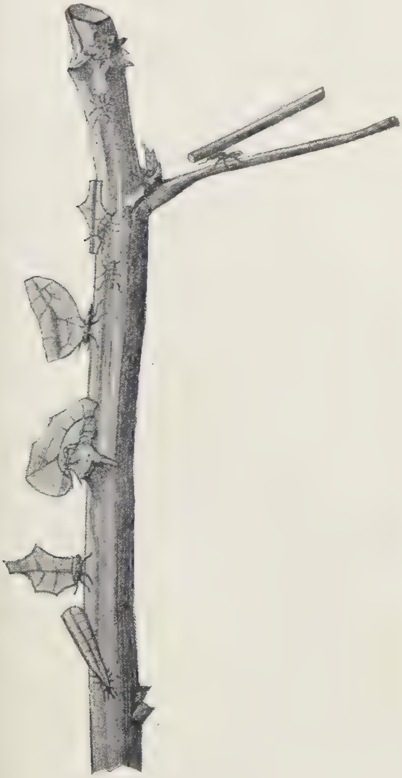
From the way in which the Robber Guests found their colonies, we may see that they can work and can also feed themselves independently. As a matter of fact, once they have founded their state, they make little use of this faculty. They appear to think that now the work of their people is done



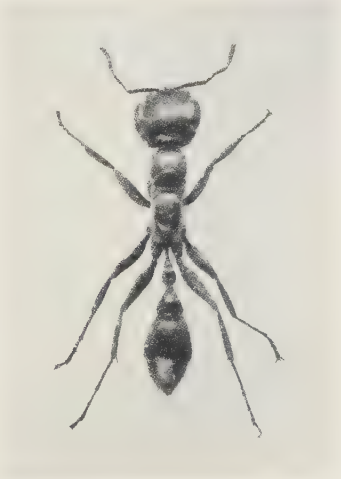
Worker of the Mushroom Growing Ant (Cyphomyrmex), a Peculiarly Shaped Ant of California.



Queen Argentine Ant, Twice as Large as the Worker.



Atta Ants Climbing to Their Nest with Leaves for the Mushroom Garden. (*Moeller.*)



The Acacia Ant Living in Hollowed Thorns of Acacia.

and that the slaves must look after everything else in the future. But as a person must do something besides twiddling his thumbs, they busy themselves chiefly with their toilet, like the Amazons. They also have games and athletic contests which are sometimes played in deadly earnest. Like the Amazons, they permit themselves to be fed by their slaves and leave to them the gathering of the food, caring for the brood of both species, guarding and building the nest. Only occasionally, as if to break the monotony, do they do anything or go on a pupæ-stealing raid.

For many decades it was thought that the Robber Guests multiplied only by parthenogenesis, because no males had been discovered, but finally a few winged males were found, closely resembling the workers. They are so extremely rare that it seems probable that parthenogenesis is responsible for most of the reproduction, but normal pairing is finally necessary. The parthenogenesis among the Robber Guests is quite different from that of other Ants. Whereas it is a rule that unfertilized eggs from female Ants hatch out as males or workers, the exact reverse is true of the Robber Guests: here only females and workers come from the several unfertilized generations, and after them comes a single generation including males. Remarkable as this seems in Antdom, it is by no means unusual in Nature. We have the same process among the Leaf-lice.

While the males of the Robber Guests are like all the other slaves, save in being winged, the females, which resemble the workers very closely, lack wings. As a result, the pairing takes place near the nest, with males flying thither from other nests. Occasionally a type of winged female does appear.

* * *

If the mandibles of the Amazons resemble sickles, the mandibles of the Scimitar Ants, of the family of Knotted Ants, are like the curved scimitars of the Turks. An entire series of species of scimitar wearers are known. They show clearly the evolution of a physically powerful people ruling over a host of slaves; living the weak parasitic life; becoming completely dependent on the service of slaves.

All the Scimitar Ants, little creatures living in a wide area about the Mediterranean Sea, have the same species for slaves, the Fourfold Turf Ants, closely related to them, and resembling them closely. The common home is the nest of the Fourfold Ant. While not related to the proud Amazon People, the Huber Scimitar Ant, so-called after that distinguished explorer of Ant-life, is much like it in mode of life. In some respects it may be more like the Blood Reds, for they are able to work and dig even without help.

The founding of a new state by the Huber Ants takes place just as it does among the Amazons;

the Queen takes possession of a stranger city by her own might. The people supports itself later by raids for fresh slaves. This was doubted, because it had been observed on one occasion that the slaves dragged out and threw away all of the stolen larvæ and pupæ that had been brought into the nest. Why this happened in this single instance, why the pupæ which were good for food as well as for rearing were despised, I can not say. There must have been some special reason for this action. To me it is true beyond question that the Huber Ants undertake slave-raids and that the brood gathered in this way is reared by the other slaves. No one has as yet discovered a Turf Ant Queen in their nest; but I have found among the Spanish Scimitar Ants, a species very closely allied to the Huber Ant, slaves of two different species, of which at least one could have come into the nest only through brood-stealing, even if it is held that the other species was conquered by a Queen of the Huber Ants. The little Huber Ants are very courageous in battle, their tactics being like those of the Amazons. They regard all labor with disdain, allowing themselves to be fed by the slaves, to which they leave all the welfare of the nest.

* * *

The Yellowish Red Scimitar Ant is not so rare as its ancestor the Huber, but very closely related, with many similarities in mode of life. Notwithstanding the wide distribution of these Ants, they are difficult to find. They are still smaller than the Turf Ants in whose nests they live, while the Huber Ants are slightly larger than the latter. The Yellowish Red Ant has really smooth Scimitar mandibles, but is far too weak to do the least harm with them. While the Huber Ants in a nest are as numerous as their slaves, the slaves are usually much more numerous than the Yellowish Red Ants, sometimes twenty times as many.

It is certain that a slave-raid is quite improbable for the Yellowish Red Ants. The cities of the Turf Ants are very populous, with a citizenry far outnumbering the Yellowish Red People, and the Turf Ant is far stronger and mightier than the little yellow fellows. It is true they do not show it when they fight. If we want to see a special performance all that is needed is to pour out a heap of stranger Turf Ants with their pupæ in front of a nest of the Yellowish Reds. At once the slaves hasten from the city of the Yellowish Reds and attack the strangers. All are black, all belong to the same species, but they come from different cities; consider one another alien peoples and hate each other as did the Franks and Saxons of the Age of Charlemagne, the Florentines and Genoese, the Venetians and the Mailanders of the Renaissance. The battle is strenuous, and on both sides a number of the Black-frocked are slain. Then a small troup of the Yellowish Reds issues from the city—to the last warrior they march forth, not one remains in the city. They fight like the Homeric heroes or the Crusaders. Many rush from the battle-line and like raging Ajaxes hurl themselves upon the mass of the enemy. This savage, heroic assault throws the mighty masses of the Black-frocks into utter confusion, and they betake themselves to flight. Their slaves redouble their efforts: the day is won for them and their masters.

This victory has cost the Yellowish Reds dear. Now they try, Amazon fashion, to grasp the heads of their enemies and pierce them with their mandibles, but they are much too small and weak. They can not slay a single one of the Turf Ants, while on their side many of their sisters who attacked so heroically lie dead upon the battlefield. Meanwhile the black slaves have made many prisoners. The Yellowish Reds try to avenge the death of their sisters upon them. All is in vain, much as they would like to punish them, and they lie there as all Ant prisoners do, without offering the least resistance. The Yellowish Reds are too weak to harm them in the least. Then the slaves have to execute the prisoners. The booty is next dragged into the nest, and here too the Yellowish Reds try to help. They do succeed, after a fashion. If one manages after a terrible struggle to drag a pupa an inch, she is proud of her effort. Finally the task falls to the slaves, who drag all into the nest.

As is the case in a single battle, so it is all life long with the Yellowish Red Scimitar Ants. They are full-blooded, courageous, filled with initiative, determination and will-power, but all amounts to nothing. They may bother a little over the brood, but they can not rear them, and must leave the task to their slaves. They can eat independently, but not enough to keep them going. They dig and build, yet leave most of this work to the blacks. Providing food is left altogether to their black friends. It may be said that the Yellowish Reds help a bit everywhere, but they are more hindrance than real help. Only in battle, their brave self-sacrificing onslaught brings about the victory by surprise.

How then did this unusual union come about? The Black Turf Ants are not at all inclined towards friendship for the Yellowish Reds. If Yellowish Reds, either workers or sexed creatures, are placed with some Turf Ants, they tear the little fellows to bits without mercy. The Yellowish Red Scimitar Ants can not dream of making slave-raids like the Amazons and Blood Reds; notwithstanding their bravery not one of any such expedition could survive. Yet it is possible for us to conceive that a young Yellowish Red Queen, by guile or force, could take possession of a nest of the

Black-frocked Ants, but even when this has taken place, since there can be no further slave-raids, when the dark race dies out, the people of the Yellowish Reds must die out also.

In every Yellowish Red city we find a Black Queen also. Her brood is reared by her daughters, as well as the brood of the Yellowish Red Queen. If it is not believed that a young fructified Scimitar female is accepted amicably by a people of the Turf Ants, or that an entire Yellowish Red People forms a union with one of the black peoples, and both are very unlikely, there is still another possible explanation of this mixed state. It is this: that after the hymeneal flight, which takes place at the same time with both species, the Yellowish Red Queen approaches the Black Queen, makes a treaty of friendship with her and gets help from her people to rear her own brood.

In the Yellowish Red-Black State we have to do with a really united state, in which two peoples live together peaceably. The black-frocked are not to be considered as in any way the slaves of the Yellowish Reds, but rather as their closely allied friends. That the tasks in this mixed state are not equally divided, that the Blacks do all the work, while the Yellowish Reds only enjoy life, has no special weight. There is another remarkable feature of this mixed state, which is contradictory of the idea that a real equality exists between the Yellowish Reds and the Blacks. We find all three types, besides the Queen-Mother of the Yellowish Reds, but only Black workers, no males or females. Only once a few male pupæ of the Blacks have been found, while of the Scimitar Ants the number of sexed creatures is larger than that of workers.

Two conclusions may be drawn from these facts. In the evolution of types among the Scimitar Ants, a tendency was developed to eliminate the worker caste, which was becoming superfluous, as the Blacks shouldered all the labor. On the other hand, for the Turf Ants, in so far as they lived with the Scimitar Ants in a mixed state, the tendency was to eliminate the sexed forms—and these were not merely tendencies; it is precisely what has occurred.

This process, on the side of the Turf Ants, clearly inures to the great benefit of the mixed state. In any case they have to take care of the Scimitar Ants; they save labor if they do not have to care for the pupæ of their own sexed creatures, which they eat and feed to the others. That they select their own sexed pupæ for this purpose is explained by science by the fact that they are much larger and thus need more food than the brood of the smaller Scimitar Ants, and themselves are fatter titbits.

I consider this explanation very poor. This problem is not so easily and simply solved. In all unified Ant Peoples the law of the sanctity of the brood holds, only in times of great need is it eaten. In the slave-states the brood of the masters is held sacred; but the slaves also give their care to the rearing of broods of their own species stolen from other nests, but never rear sexed types. If now, in the Scimitar-Black State the Blacks destroy all of their own sexed creatures, and at the same time rear the sexed types of the Scimitars, they are doing what never is done in any individualized state, but what is done regularly by the slaves in a slave-state. Thus they present themselves as real slaves and the scientists err when they call the relation between the Scimitar Ants and the Blacks one of equality.

In all respects, the Yellowish Reds are the mistresses. They really never work, but allow the Blacks to serve them in every way. Since they are too weak to go on slave-raids, they occasionally give a hand, so as not to die of monotony, but almost in the same way that I go into the kitchen, and stand around until at last the cook begs me to get out, as I am in her way. The Blacks do all the work and prove their real slavish nature by sacrificing to the welfare of their mistresses even their own progeny. They are actually larger and stronger than these mistresses, but just as the little Scimitar Ants, without effective weapons and really helpless even to inflict a wound on an enemy, by their tremendous bravery bring terror to the heart of the embattled opposing hosts, and throw their ranks into confusion so that their side gains the victory, so also they understand how to secure respect within the nest, by their conduct, and to compel the Blacks to believe that they are the slaves, and the Scimitars are the mistresses. These little, weak animals, who owe everything to their own energy and will-power, can hardly be explained away as degenerate by solemn, pedantic science.

What a pity it is that we can not understand Ant-language as the Ants understand human language. I would like ever so much to listen to the opinion of one of the Ants regarding the wise Professor who takes to pieces a Scimitar Ant and declares it a "degenerate." I believe that the gay little fellow might call Goethe to his aid and reply to the Professor:

"What Hangman! True my hand and feet
And head and body—they are thine!
Yet all that I can now enjoy,
Is that therefore less mine own?"

* * *

There were many Ant Peoples in gray prehistoric ages which supported themselves on happy hunting grounds or by keeping cattle, just as some still do. In the course of time they became more and more conscious of their own power, as they fought with their neighbors; their peoples became more numerous; the individuals became larger and braver. Ruthless robber barons developed from the hunters and shepherds, gaining a livelihood by highway robbery, war and rapine carried into alien cities, whence they took away great booty. Inclined to this wild mode of life, they had less and less use for domestic pursuits; they learned how to bring up the stolen brood and to leave the work to these aliens. Thus the robber barons became slave-raiders. Still able to do any kind of work, we see the Blood Reds, which have some cities without slaves; or if there are any, they are willing helpers, devoted to making the state stronger and mightier. They stand upon the peak of this evolution.

One step further, but now descending the mountain, we find the Amazons. They still preserve something of their figure and strength, their wonderfully developed natural weapons, perfected for all that has to do with war, robbery, slave-raiding to the highest degree. But they have developed this perfection as warriors at the expense of their other inherited faculties. They can no longer dig nor build, can not even rear their young, but must leave all that to their slaves. They have even lost the faculty of feeding themselves independently, and have to permit themselves to be fed by their servants, upon whom they are utterly dependent: the "degeneration" has begun. Step by step the descent of the mountain of achievement continues, thanks to the unnerving influence which slave-holding has brought about.

Instead of the big, strong, fighting Amazons we find forms growing smaller and weaker. The Huber Ants can neither fight nor go upon slave-raids; the Yellowish Red Scimitar Ants are absolutely powerless, substituting for the bodily power an almost comic savage energy; building their entire life upon assertive bluff. Upon the lowest level we find some species which have degenerated into absolute parasitism through slavery. They are small and weak in body and brain, have lost their own working class altogether, are small in population; in short are upon the verge of dying out altogether.

Thus does Science present this development. Unquestionably this picture of the ascent and descent of a species of Ants through the slave-holding instinct is very pretty, and has something extraordinarily alluring in its presentation of each perceptible step in the development. Some species of Ants are just beginning this course, others, such as the Blood Reds and Amazons, are at its apex, while the workerless Ants have traversed the entire path and now approach their end. The circle is closed: the Ants have now gone back precisely to the point at which they were billions of years ago; without workers.

This is really an arresting thought and a beautiful scheme. It can be utilized too very practically (for Science is always eager to further morality!); but unfortunately, it does not hold together. The Scaled Ants to which the Blood Reds and Amazons belong, have no connection whatever with the Long-necked and Knotted Ants, to which the Digger Ants, Robber Guest Ants, Scimitar Ants and Workerless Ants belong. The shape of the body of the Workerless Ants proves that they have not descended from the Slave Hunters. Their forefathers were Guest Ants long before them. All these separate steps exist, but there is no connection between them. Evolution from one to another can not be demonstrated.

Scientists have not yet grasped the true significance of the passive slavery-instinct, thus have we been spared their learned lucubrations on the subject. Here too it would be possible to construct a diagram of degeneration; in the Red Wood Ants, for instance, might be shown how the instinct of mastery, the active enslaving instinct, is metamorphosed into the passive slave-instinct, the desire to be a slave; or the Stupid Ants, among which the stranger Queen rules after having murdered their own Queen, up to the Black Turf Ants, which exemplify their slavish instincts in every possible form, serving a species much weaker and smaller than they. But here too, there is not the slightest connection between the various Ant species, which manifest this slavish instinct. It is impossible to demonstrate any evolution. Science is enthusiastic over every diagram, but Nature throws these diagrams on the ashheap.

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We already know half a dozen workerless species; and certainly in the future more will be discovered. All of them are rare; their population is small; the individuals are small.

The Wheeler Ants were found in Tunis two decades ago. They live with the Solomon Ants, a Knotted Ant, like them. Male and female are winged; nevertheless there is no hymeneal flight, but brothers and sisters are wedded in the nest. They fly out afterwards, the males only to die, and the females to found new peoples. The young Queen looks for a Solomon nest and walks about near it, until she is caught by one of its workers. She allows herself to be captured, most amicably, and to be taken into the nest. If it is too long before she is found, she herself goes into the nest, and allows herself to be captured there. The Solomon Ants usually treat her well, beginning by feeding and petting her; and after a few days she begins to lay eggs. The young brood is taken care of by the Solomon Ants, whose love for the stranger Queen increases day by day. Their love for their own Queen decreases in the same ratio; she is neglected more and more, until some fine day she is slain by her own daughters—one of the rare instances of compulsory matricide, known to natural history.

The founding of a people by the American Cosaving Ant which lives with the Saving Ants and is still smaller than the Wheeler Ants, is much the same. All these species are physically normal and not in any way arrested in development. The European Workerless Ants alone have reached the lowest depths in Antdom; they alone may be termed degenerate. They live with the Black Turf Ants, the species of Ants in which the slave-instinct is especially strongly developed.

If a young Queen of the Workerless Ants comes to a city of the Blacks, she can easily count upon owning that city herself exclusively very soon. She is lovingly received, petted and cared for, and can at once proceed to lay her eggs. It is bad luck indeed if other sisters of hers come in with her, for they will all be slain or driven out, and she alone will remain as mistress. The rightful Queen of the Black-frocked Ants will be neglected, and finally slain and thrown out by her own daughters; for they insist upon living in self-imposed slavery as the slaves of the new Queen.

The population of the city now consists of a large number of Black workers and one Workerless Queen. This Queen is very small, but now her body begins to swell enormously; soon she looks like one of the balloon-stomach workers of the Honey Ants, which pass their lives as living honey-casks. Only these hang beautifully next to one another from the ceiling of their cellar, while the Workerless Queen lies about on the ground and can hardly move herself. She can hardly touch the earth with her legs, and holds fast to the wall. Her servants are very busy, feeding her, cleaning her, and carrying her from one room to another. Meanwhile the Queen is laying eggs; and the young brood is being gathered in the nursery. It is not very clear what happens to the brood of the former, slain Queen, as we never find any of the brood of the Turf Ants in the nest. It is possible that as they develop the unnatural hatred for their own Queen-Mother, they also feel a sudden abhorrence of their own brood and either devour them or throw them out of the nest. It seems to me more probable that at least the older larvæ and pupæ are reared, and for that reason we never find any of the brood of the Turf Ants, because hitherto no one has been so fortunate as to happen upon one of these nests just after a Workerless Queen has taken possession.

Meanwhile her brood grows up, well cared for, but they are only sexed creatures. The worker caste is no longer necessary, for all the labor, without exception, is performed by the Black-frocked Ants. The young females are very small, dwarfed winged creatures, but the males are really badly malformed. They look more like crippled fleas than like Ants. They have no wings; the color is a sickly yellow, the hinder body, as in the larvæ, bent downward. These monsters can not even walk well; they merely limp about. In most cases they even lack that most necessary organ in Ants, the cleaning brushes on the front legs, so that they can not cleanse themselves properly. The upper jaws are small and weak. The eyes, which in sexed Ants are usually well developed, are arrested in the males of the Workerless Ants. The Black slaves manifest a special preference for these horrid objects. They carry them around, lick and cleanse them constantly. They bother little with the more independent winged females, although they do feed them, as well as the males. They can not take food independently, for the mouth-parts are dwarfed.

Since the males are wingless, the wedding between brothers and sisters must take place in the nest, but even in this regard the males prove themselves stupid and inept, acting in so purposeless a way that many of the females are unfertilized. The pairing does not seem like an Ant-wedding; it seems more like the awkward hanging together of Beetles.

After the bridal the females fly forth. The slaves now lose their love for the males very suddenly, which are taken out of the nest and left to their fate. The length of life as well as the tenor of life for the Workerless Ants is altogether dependent upon their trusty Black servants. A generation of the Blacks may last three or four years. They may annex some wandering Turf Ant workers during that time, but this will not prolong the life of the state. The Black servants die, one after the other; with their death the fate of the Workerless Queen and her brood, her daughters and monstrous sons is sealed. At best a fertilized female may fly away and be saved by other Turf Ants. The rest are irretrievably doomed to starve to death. This kind of death is the natural end of every Workerless Queen who manages to found a people.

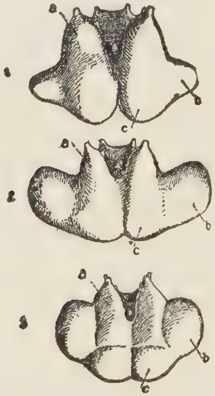
CHAPTER XV

THE SOUL OF THE ANT

The bond between every Man and every Animal of the outside world is made possible through the senses. If we are concerned with the soul-life of Man we need give slight attention to the senses, if dealing with individual investigations, as each person experiences his activity in every waking second of his life, and has a sufficient knowledge of them from the mass of experience. But if we are concerned with an Animal, of whose soul-life we can gain knowledge only through the study of its sense-changes, we have to study these senses very deeply, because often they differ greatly from the human. We must try then, so far as we can, to think ourselves into the being of a creature with senses very differently developed. Only in this way may we secure relatively certain bases for our conclusions.

Science has assigned very slight importance to *sight* in the Ant. Some species, at least in the worker caste, have no eyes; others have eyes, but no optic nerve, so that they too are blind. In those species that can see, the eyes of the workers are poorly developed; they have a much smaller number of facets than the eyes of the sexed Ants.

The females have much more useful eyes, and the males have still better, both requiring them for the hymeneal flight. Besides these eyes at the side of the head, we also find, as a rule only among the sexed creatures, eyes in the forehead, either one or two, at most three. We do not know the use of these eyes. Some have suggested that they are for seeing near in the dark, and many accept this suggestion.



Wood Ant Brains
1. Worker
2. Queen
3. Male
a. Centre of Smell
b. Sight
c. Association.

As a matter of fact, sight plays a greater part in the life of Ants than is usually admitted. The Ant's power of finding its way outside the nest has been ascribed chiefly to its sense of touch and smell, whereas vision plays an important part. The direction from and to the nest is fixed by the eyes, which serve as compass. Thus if a part of the way home be flooded with water, obliterating all scent-traces, the Ant still holds the direct line back to its nest, swimming. If a turntable be placed on a road over which the Ants must go, it is easy to observe how the Ants still keep in mind the direction of the nest. Let us assume that here are a number of Ants on the turntable, returning home laden with spoil. If we turn the table around, they must travel away from the nest. But they notice the mistake very quickly, and again turn in the direction of their nest. In other words, they guide themselves by the source of light: in Nature, by the sun, whether shining or clouded; by the electric bulb in the laboratory. Moreover, the Ants guide themselves by landmarks, such as stones or bits of wood, in which the eye plays as large a part as the sense of smell. It is peculiar and hitherto unexplained, how remarkably they calculate their distance from the nest. If the turntable with the Ants that have run on it is removed two yards to the right, the Ants will run in a straight line, paralleling their road, guided by the source of light. Naturally they will not find the nest. Precisely two yards to the right of it, they become uneasy: here they expected to find their home. They do not go farther, but circle around searching for the nest.

The eye of the Ant is developed sufficiently to recognize the difference in colors and shapes, of course differently from the human eye. Long-wave light rays they perceive as short; violet is more visible to them than red or green, and therefore less agreeable to them, while these colors are of higher visibility to us. In the spectrum we see three primary colors: red, green, violet. The Ants see only two: one color, made up of the violet and ultra-violet rays, and another compounded of red and green. The male proves his power of recognizing shapes by recognizing the flying female at a considerable distance, while the less highly developed eyes of the workers can see only for a short distance.

The sense of *touch* in Ants, only slightly investigated, extends over its entire body. We find hairs of touch everywhere, but they are especially fine and numerous on the feelers. As the Ant is constantly using these feelers, we may suppose that it gains a picture of the object touched through the feelers, much as a blind man gets his representation of his surroundings. The feelers also carry impressions of smell. Touch and smell are combined here into a special sense. As to the touching hairs with which the body is covered, we may speak of a purely touch sense; even where there are none of these hairs, the Ant may feel. Doubtless Ants do have a sensation of pain, even though not so intensely as Man. The experimenter may clip off a leg or even the entire hinder body from an Ant, while it is eating, and it will hardly notice it, but calmly continue licking up honey. Nevertheless it was noted during the late war, very often, that soldiers received dangerous, deadly wounds which they did not notice in the heat of battle, and felt only afterwards.

If man surpasses the Ant in the sense of vision, the sense of smell is better developed in the Ant than in Man. The organ is located in the feelers. If these be cut off the Ant will recognize neither friend nor foe, and will not even find food. It is not necessary for it to touch anything with its feelers in order to scent it, for it receives the smell from a distance. Here there is quite a similarity between Man's sense of smell and the Ant's. But if the Ant touches something with its feelers, in the Ant the sensations of touch and smell are compounded, so that it does not distinguish one from the other; there is no one and other,—but a new complex sense perception. Simple and enlightening as this may appear at first sight, the activity is that of a double sense, a touch-smell, not so easily explained, try as we may, for we have such distinct concepts of touch and smell as different that it is difficult for us to get away from them.

We might try to imagine that we are blind and have an Elephant's trunk-nose, which can not only smell keenly, but at the same time can feel clearly. With this touch-nose we approach anything in order to get a perception of it, and it will be done habitually, just as we now utilize our eyes for an impression. The fact that we get the perception of the form by touch and odor by smell at the same time and that this is a blended perception, which can not be separated into two, but comes to us as one, might be expressed in the compound words "round-rancid" or "bitter-pointed." This may clarify our understanding of how the outside world appears to a creature which gets the impression through vision, and to another creature which perceives it by touch-smell. In addition, we must be well aware that our human sense of touch and sense of smell are much arrested when compared with the keen sense of touch-smell of the Ants, as found in their feelers.

Smell and taste are very difficult to differentiate even in Man. How often one passes over into the other is apparent in all cultural languages, for similar expressions are used for taste and smell. We say it tastes, or smells, sour or sweet, rancid or bitter. It is the same with the Ants. Although as a rule they like whatever smells good, and refuse whatever smells bad, it is easy to establish a special sense of taste. We need only mix their choicest food—honey—and something unpleasant to them, but odorless, such as morphia. Enticed by the smell of the honey they hurry towards it, but they notice the repulsive taste, as soon as the honey touches their mouths, and will not eat it.

We are not so sure about the sense of *hearing* in Ants. The understanding between Ants is a touch-language, possibly comparable to our language of the blind, for they communicate with one another by touching each other with their feelers. But it is no less true that the Ants do communicate with one another at a distance, and that they can produce some sounds under certain conditions; so, even though we do not know how they do it, we must conclude that they can hear. Some investigators hold that the organ of hearing is in the forelegs. Feeling and hearing, like taste and smell, are closely associated even in Man. That they are distinguished as separate is due to the fact that the airwaves which bring us sound are not felt, because our sense of feeling is not sufficiently keen to feel the impact. If, however, we are swimming with the head under water, we will not only hear but also feel a loud sound at the same time.

Upon a sudden threat of danger to the nest, the Ants of some species strike the ground with the hinder body, others strike the walls of the nest with their heads, giving the alarm, which is perceptible even to human ears. Besides this some species of Ants have a sounding organ on the hinder body. They are able, by rubbing the plates of their armor, to produce chirping sounds. When a worker finds a good feeding place, she begins to chirp, calling her sisters thither. In some species, such as the Mushroom Growers, we can hear this chirping plainly. The largest females can chirp loudest, and in descending scale, the soldiers, the males, the larger, medium-sized and smallest workers, and in this way every one of their people can hear anyone that chirps for help.

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The brain as the nerve centre receives all of the sense impressions and works them over. It is very small and dwarfed in the males; much better developed in the females and workers. In some species in which the Queen has a great task to perform, especially after the founding of her people, taking part in the regulation of the life of her state, and not limited to mere egg-laying, the brain of the Queen is at least as large as that of the worker. In other species in which, after founding the people, the Queen plays only a passive part, the brain of the workers is better developed. As a result the male Ants have the sole function of reproduction, while the females and especially the workers possess comparatively high mental capacities.

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When "Wisdom," Naturalists, Philosophers and Theologians begin to discuss instinct, sane men are driven to the utmost disgust. There is a confusion of concepts to which the confusion of tongues at the building of the Tower of Babel is the simplest statement in a child's primer.

The final result is quite the same whether the concept be termed instinct, mind or understanding. The chief thing is that the word should have a fixed meaning in the language. Only when they mean something distinct can anything be accomplished; so long as these are nothing but floating concepts, always passing from one to the other, all of the bombastic wording is nothing but silly tight-rope dancing. With one of them consciousness and mind are interchangeable, and with another reflex and instinct; instinct and intelligence. What the first terms reflex, the other calls instinct, and the third terms intelligence, while the fourth finds it to be instinct and the fifth puts forth a new cloudy concept, lying between instinct and intelligence, which he calls plasticity. He achieves nothing in this way, for he explains and clarifies nothing by his new concept, but only makes it all muddier and more confused.

It is clear that all of these concepts pass over into one another, at certain points. Therefore it is necessary to draw sharp lines of demarcation, and first of all to fix the real significance of each term unmistakably. I have read much in the works of the most learned sages, and must admit that they confuse these concepts more and more every year. From Kant, Schelling, Schopenhauer, E. von Hartmann, Spencer, Wundt, Claude-Bernard to Bergson, Driesch, J. Loeb, Semon—only to mention a few of the best known names—the road leads ever deeper into a maze. A book might be filled with all the different definitions of instinct alone.

Among the leading myrmecologists of our day—Forel, Wasmann, Wheeler—I find the following definitions:

"An instinct is a more or less complicated activity manifested by an organism which is acting, first, as a whole rather than as a part; second, as the representative of a species rather than as an individual; third, without previous experience; and fourth, with an end or purpose of which it has no knowledge." (Wheeler.)

"Instinct has its beginning where conscious life is present. . . . Only those activities may be termed instinctive which have their nearest cause in a sensuous perception, sensation or conception. The unconscious purposeful connection between certain sense-perceptions or sensations and the corresponding action and outward activities—that is actually the essence of Instinct-action." (Wasmann.)

"Instinct is an inherited fixed and transmissible, hereditary, many-phased engram-complex, the first phase of which is ecphorited through a specific, actual, energetic situation, and the later phases—under fixed control together with the latest developed stimulating situation—develops further as an automatic process successively and more or less forcefully." (Forel.)

Now may I ask my very patient readers to re-

read these three little proofs of human thinking. The definition by Forel necessitates a very thorough study of all Semon's doctrines, if it is to be understood at all. It is actually no definition of instinct whatever, but as Forel's inspired pupils say: "a conclusive setting aside of the old threadbare instinct-concept by substituting a clear, enlightening explanation." Conclusive? nothing in science is conclusive; what exists for ten years has survived a long time. Clear and enlightening? Possibly it is so for scientific pedants, but the layman as well as every one not trained to purely biologic scientific nomenclature, can gather not a scintilla of an idea from it.

The statement by Wheeler is quite comprehensible even to a layman, but it is purely formal and to the biologist utterly meaningless. For how can any one prove where in an organism the whole ceases and the part begins? And no one in the world can conceive an activity "with a purpose of which it has no knowledge."

But the most dangerous is Wasmann, who is juggling with his "unconscious purposeful" in his definition, as is always the case with him where a concept of instinct is concerned The confused concepts of science are most welcome to him for getting out of difficulties. He uses the term instinct indiscriminately for all possible changes in the animal-soul, denominating as "instinctive," activities never spoken of as such by any one else, or that could be so described. When he has to do with special instances of suspended changes, so-called "plastic" adaptations, on the basis of individual experiences, he himself speaks of instinctive activities. This scientist has as his final purpose only one thought in his head: to save the doctrine of St. Thomas Aquinas as to the human soul. For this reason animals can not possess any intelligence, under any circumstances even the concept of "plasticity" is objectionable, because it has an odor of intelligence about it. Man alone is intelligent, and he is so because he received a soul from God. So Wasmann always closes with a *Te Deum,* trying always to prove that only a personal God could have created this wonderful world. How scrupulously he adheres to this policy may be made clear by the following quotation which he cites from old Peter Huber:

"As I view these swarms of peoples (the Ants) which live at our feet, and among whom order and harmony exist so perfectly, I think that I see the Creator of Nature, how He with Almighty hand prescribed the laws of a republic (of the Ants) which is free from all abuses; or how He designed the original plan of this mixed society (the slave-state), in which service is bound up with the interests of all!"——"That," says Wasmann, "may also be our concluding word!"

When the excellent Peter Huber wrote these words over a hundred years ago, they were really true, but as the concluding words for Wasmann they seem to be a blasphemy of God. At other times Wasmann laughs at Huber, calling him "woefully rhetorical"; but here all at once he takes as his own the beautiful but "woefully rhetorical" words. And he does this after saying in a hundred pages or more exactly the opposite of what Huber wrote in this sentence! Huber really believed that the Ant Republic was "free from all abuses," believing that in the slave-state "service was bound up in the interests of all"; and therefore, because of this "order and harmony," he praises God. Wasmann has tried to prove through long years of gathering experiments and information, upon substantial grounds, that in the Ant Republic there are many very bad abuses, and that the service is not only not "bound up with the interests of all," but, on the contrary, is very injurious not only to the slaves but to their mistresses as well! Whence does he derive the spirit to praise God for this?

But it would be a great injustice to nail Father Wasmann fast only, and let the other sages go free. All of them have rendered great service and I have learned much from them, but all of them have irritated me, each with his own spleen. Forel is one of the leading culprits. I must devote a moment or two to him because the case of Forel offers me a special opportunity to show why it seemed to me necessary that this book should be written not by a "scientist" but by a layman. His book: "Man and Ants" appeared lately, not in a scientific, but in a popular edition. It is apparently written for the general class of readers. In the preface Forel calls this book "a summary of his studies of the Ants during sixty-six years, combined with his studies of the various functions of the human brain, as well as a presentation of the ruinous influence of the World War."

As far back as 1894, at the sixty-sixth meeting of the German Naturalists and Physicians in Vienna, Forel uttered a sentiment which seems so beautiful and valuable to him, that he repeats it now as quite basic: "The study of the phylogenetic evolution of animal biology leads us to the conviction that the most original activity of the nerve-waves is more plastic, which nevertheless leads to the formation of one-sided inherited automatisms through a slighter number of elements and higher demands. Besides both activities are relatively different. In every acquisition we can study within ourselves the constant transformation of one into the other, whether centrifugal (technical activities) or centripetal (abstract thinking)."

The gentlemen at Vienna must have thought themselves very stupid when the world-renowned investigator threw this wonderful statement at their heads. Of course no one on earth could understand it when it was spoken. If it be read, a person with some effort may grasp something of what Forel meant to say, but at the same time the reader can not help feeling that he himself is by no means sure of what he wants to say. From what follows it appears that this scholar is merely juggling words. There he states: "Because the individually inherited brain-grams are always combined among themselves through the newer ecphoria which are ever more numerous and varied, the work of the neurones becomes more plastic; i. e., more easily modified."

Here is utter nonsense! Why in the world should the work of the neurones become "more plastic" through this?

"That latent accumulation," says Forel further, "of the individually inherited brain-gram in the course of thousands and millions of years brings about gradually in every kind of mode of living the elimination of new inherited characteristics inherited in this way (de Vries: Mutation)."

Yes, indeed, but mutation is itself direct! The doctrine of de Vries would have to be stood on its head to say that mutation comes through accumulation! Or perhaps Forel wants to express the simple truth, that "Nature produces infinite individual variations." What did he do? He struck his hearers on the ear with this terrific statement: "This world-potency has within itself the power of plastic expansion in an infinite evolutionary diversification in the detail of its appearances."

These examples must suffice. I have presented them at such length, so as to show the confusion which rules in the head of this great scholar and at the same time to show the unscientific, but cultured layman, how a real scientist expresses himself when he writes popularly. So clear, so simple, so easily understood! For this work of Forel's is written for the people. Although this sage writes really clever accounts of the Ant World, he believes that he can now solve the most difficult problems in the world through them. It is so easy for him to make all nations and all mankind happy and he offers this very simple recipe: prohibit alcohol, woman suffrage, a general supernational pacifistic army, war against gambling, Esperanto, the Bahai religion. Then nothing will be lacking, thinks he. If only Messrs. Masaryk and Benesch, and China and Bolshevik Russia, and the English Labor Party will give him a little assistance, then the "real World-National-Union will become inevitable, and after setting aside the fixed claims (and some others) of the World Peace of all the states, will easily establish human happiness."

All this is a grotesque joke. The learned Professor wishes to be taken seriously. I do not doubt for a moment that quite a number of persons will do so. The stupider a plan for bringing redemption to Man, here or hereafter, the more certain will it be to find a horde of idiots who proclaim it a great gospel. All the more easily in our time, which a laughing posterity will pronounce the acme of foolishness.

* * *

To Schopenhauer instinct is "the most vital revelation of the will to live"; to E. von Hartmann, "the powerful activity of the unconscious, one's own action of the individual, springing from his innermost being and character." Biology can of course do nothing with these; but the non-scientist can do all the more, if he does not accept them literally, but metaphorically as was intended. We may advance better if we consciously desist from conceiving some ambiguous ideas absolutely, but rather try to feel them unconsciously. It is impossible to prove where instinct begins; only by a convention in language, but never scientifically, are growth and development reflexes, reflex-chains on one side to be divided from intelligence and instincts on the other. When the larva emerges from the egg, and grows into a pupa, the pupa into a little Ant, that is certainly "development." The activity of the larva is needed for this, for it spins the cocoon for the pupa. Any one would call this instinctive activity. Does the purely organic activity continue in an instinct, which it utilizes as a means, or does the instinct bring about primarily the organic activity which it utilizes? It seems immaterial whether I consider it from one end or the other;

both appear to be correct. Hitherto I have avoided the use of the word *triebe* (urge) purposely, because it can not be translated easily into most foreign languages. This word is so fixed in our flesh and blood that we Germans know its content very clearly, and require no confusing definitions. Love and hunger are the great "urges"—self-preservation and reproduction—in which all the instincts are joined, in man no less than in Ants and other creatures.

The two "urges" of self-preservation and reproduction are served by all the instinctive feelings and instinctive actions of Ants—the building of their homes, care of the brood, providing food. Within the castes of an Ant People the variations of instinct are recognizable. In the males they are altogether undeveloped, only sufficiently existent to make it possible for them to perform their function for the state. They beg food from the returning workers in the nest, *to keep themselves alive,* and at the hymeneal flight, equipped with good eyes, they seek the flying females so as to serve for *reproduction* for a few moments. On the other hand, the female has all of the instincts of her kind united in herself. Each one of her actions after the wedding exemplifies another instinct. First she casts aside her wings, which are now only a hindrance. Then she digs a hole, shuts herself up in it, and begins to lay eggs and to rear her brood. All this takes place with such certainty and spontaneity that we might think it a chain of reflexes, which are released by another chain of impulses, but if we examine it more closely, it is very easy to prove that we can call it no such thing.

The young Queen alters the set plan at once, at the slightest opportunity, so as to attain her end more quickly and better. She will certainly not dig a hole, if she finds one ready made. If, after the marriage, she is found by some Ants and treated in a friendly way, she is quite willing to be taken up and accepts thankfully any help given her. If she belongs to one of the species in which the female founds her own state by forcing her way into a stranger colony, a long series of possibilities are presented, of which she utilizes those which seem to her the best fitted. If she is sitting in her hole alone, busily engaged in bringing up her brood, compelled to devour some of her eggs, in order to keep alive, and a little honey is offered her, she will take it gratefully and feed her brood with it. In short, we find that her instincts are by no means fixed, in no way inflexibly responsive to certain outer stimuli, but very elastic and adaptive.

In the worker caste we find the instincts of the mother more sharply presented and often very discordant. The workers in many species have better developed brains than the females, consequently showing comprehensive activity. There has been considerable discussion as to how the workers could inherit these progressive instincts, for as a rule they are only aunts, and not mothers. As a matter of fact parthenogenesis is far more prevalent among Ants than is generally supposed. Some of the older workers become sexually mature and lay unfertilized eggs; in this way their descendants can inherit the instincts in the highly developed form which was possessed by their mother.

Some instincts may become dim, or be lost altogether, while others are developed all the more clearly. We have seen among the Amazons how they have lost the instinct of feeding themselves independently. Other instincts may be developed in a fashion which is very harmful to the people, such as the misplaced instinct in the Blood Red Ants, by which they rear the brood of the Fringed Beetles instead of their own.

It is immaterial whether we explain instinct as rising from below or going down from above, whether we term it "sunken intelligence" or a higher development of the reflex mechanism. As Bergson said, it is easy for either of these explanations to triumph over the other. We can just as easily prove, and this has been done in long disquisitions hundreds of times, that instinct can not be a pure reflex, as well as that it must be something very different from intelligence, when it has sunk into the unconscious. Both of these are basically mere symbols, one attainable from one point of view and altogether useless from the other, but if we think that intelligence has attained its highest development in Man, of all creatures, we shall have to add that in Antdom the instinctive faculties have attained their fullest power.

* * *

I have avoided the concept "plasticity" purposely, for I am convinced that inserting it between understanding and instinct has not made the comprehension of the problem any clearer. Ever since science discovered this beautiful word we have had new definitions of it annually, all differing widely from one another. Our ordinary use of language does not avail itself of this word; the word "intelligence" is quite sufficient in all languages. The German feeling for language is very clear here, for every one who talks about understanding thinks of human understanding alone. The content of the word "intelligence" is more far-reaching and embraces all that is beyond instinct, and is also applicable to animals. The word "plasticity" has brought nothing but confusion, according to its explanations. Whether I conceive it as "acting according to individual experience," or as "allowing to an organism actions which are fitted to the moment, without taking note of the tendency of an inherited adaptation," or as "an activity which rests upon an historical reaction basis," the use of the word "intelligence" in all cultural languages covers the idea.

We can always observe alterations in intelligence among Ants. It is clear that they do not possess the highest intelligence attained by Man, that they have written no "Faust" or composed no "Don Juan." It is difficult to determine whether we may attribute the power of making abstractions to them, or not. I prefer to affirm it, rather than deny it, at least so long as I must admit it for every individual man. The chasm which separates the *Amœba primitiva* from the ordinary business man is not nearly so deep and wide as that which parts this worthy from Dante.

The *thinking* power of the Ant is most astonishing, as it is presented on every occasion. We saw that the Amazons send out their spies systematically, to seek out the nests of the slave species. They bring back information, not only of the general location, but the precise position; the entrances and all other details are fully reported. Nor does it follow that this city is taken over during the next few days. Possibly other spies have found other cities, which they decide to attack first, or the weather does not seem propitious; in short, the expedition to this nest may be postponed for weeks. Sometimes the nest has so extensive a brood that the Amazons postpone the plundering until the next day, or they take away the booty during three or four days. They take special care to ascertain if there is anything else worth taking; they never go back to the nest that has been cleaned out. In the same way the Herder Ants know the pasture grounds of their herds of cattle. If the Leaf-lice are removed from their pasture, the Ant milkmaids come there the next day to milk their cows, and run around in great excitement looking for the missing cattle, and finally return home with empty crops. But they now know that there are no cows on this pasture, and they will not look for them there any more.

It seems to me that the importance of the touch-smell sense has been too greatly emphasized by science, for many of these scholars attribute to it the Ants' power of finding their way back to the nest. As a matter of fact the Ants do not utilize it, but only follow their own tracks back. If, for instance, they go forth with all their baggage in search of a new nest, they follow no special trail, but travel well spread out, each individual for itself, carrying eggs, larvæ, pupæ or grown sisters. As we have seen, vision plays a great part in finding their way. But some Ants find their way, even when Man, so far as human cleverness can, has eliminated both possibilities. The odor of the footprint can be removed easily, if a part of the road is covered with water. The Ants, however, swim straight towards their goal. It has been observed that Amazons, after their meadow has been flooded by a cloudburst, so that all traces of their trail must have been obliterated, on the day following hastened forty yards to a slave state to get the remainder of the brood.

As a matter of fact, the way in which the Ants find their road is highly varied, the individuals and groups acting in various ways. Beside fixing their direction through the touch-smell sense, they utilize the source of light, as well as gravity, in ascending or descending country; also special conditions and such straight lines as walls; the direction of the wind and the magnetic pole. Possibly they utilize other means of which we are still ignorant. The Ants also possess a remarkable *place-memory,* such as is to be found among only a few highly organized mammals and very few Men.

Their memory is no less remarkable when it comes to recognizing one another. Nest companions who have not seen one another for months recognize each other immediately. The recognition of friend and foe instantly has been explained as due to the touch-smell sense, which makes it possible for the Ants to note the peculiar "nest-odor" of their own people as distinct from that of all others. Yet the problem is not so simple as appears at first sight. It is assumed that this "nest-odor" is not present in the pupa as it slips out of the cocoon, but only develops when the chitin hardens, and then attaches to the individual animal. This would aid in explaining why an Ant which is removed from the (artificial) nest as soon as it emerges from the cocoon and kept away for a long time is nevertheless immediately welcomed as a sister if it is placed in this nest. In the slave-states, the slaves have their own "nest-odor." It is taken for granted that the mistresses, reared by the slaves and licked and cleansed by them, also get something of this "nest-odor," a kind of "mixed-odor."

Although all Ant investigators agree in this, it seems to me that this explanation is not quite valid, holding as it does some patent and insoluble contradictions. A young Amazon Queen, to give an example, forces her way into a nest of the Dark Grays and is accepted by them. Certainly she has not the "nest-odor" of the Dark Grays, but an inimical odor, which does not stand in the way of her acceptance into the stranger nest, as their Queen. The Dark Grays now rear the first brood of the Amazon Queen, and through their licking give them the "mixed-odor"—Amazon-Dark Gray, which their brood also will take on. The people grows; the young Amazons steal the brood of a Red-bearded People, which grows into a new brood, and which develops a peculiar "nest-odor" through the licking into a mixed-odor "Dark Gray-Red-beard." Another Dark Gray People is robbed of its brood; thus a third young slave-brood is reared, consisting now of Dark Grays cared for by Red-bearded nurses. Again the new brood has brought into the Amazon State its own nest-odor—for it is not only every species but every people that has its own peculiar nest-odor—and once more this nest-odor is neutralized into a mixed-odor by the licking of the nurses. So the process may go on *ad in-*

finitum; new mixed-odors developing in the realm of the Amazons.

High as my esteem is for the touch-smell sense of Ants, it can not be equal to this task. I am persuaded that finally not a single Ant would be recognizable, least of all the Amazon mistresses, whose powers, highly developed as they are for warfare, are fitted for nothing else. The result would be that, according to the generally accepted doctrine of nest-odor, the *brood itself* would no longer have any peculiar nest-odor, as this is developed only when the young have become real Ants. If this were the case, how would the slave-nurses know the different broods apart? That they can not recognize them by vision in the dark nest is clear. That they do distinguish them is just as well proved. All the brood of the mistress species is sacred, is carefully reared, but the stolen brood taken from slave-states is treated very differently. The stolen larvæ and pupæ of some species, such as the Sooty-haired Garden Ants are never reared, but serve as food. The brood of other species, such as the Wood Ants or the Meadow Ants, are devoured in large part, but some are reared. The brood of the Dark Grays and Red-bearded, especially well adapted as slaves, are brought up by the slave-nurses to a very large degree; yet each species prefers its related kind. The Dark Gray nurses favor the rearing of Dark Grays; the Red-bearded give the preference to the

Red-bearded. And again; the nurses distinguish between the sexes, rearing only the workers of the stolen broods, never the males or females. And they do all this without "nest-odor," *for the brood has not yet acquired this odor.*

In view of all these considerations, the doctrine of the "nest-odor," fitting as it seemed upon first appearance, is now superfluous on all grounds. That it is absolutely untrue seems proved by the following experiment. If we take a large number of workers of the Dark Grays, and keep them in a separate nest; then place a fructified Amazon Queen in the first nest, she will be accepted as Queen by the few remaining Dark Grays and her brood will be reared. If now the workers are returned to their first home, their sisters, *who have their own peculiar nest-odor, the odor of their own people,* will not receive them amicably, but fight them as if they were enemies. I would not attach such great value to this experiment in an artificial nest, were it not supported under natural conditions.

Peoples that establish colonies, such as the Wood Ants or the Blood Reds, treat them generally, citizens of the mother-state or of the daughter-states, as ONE People: sisters in nest-odor. But sometimes a daughter-state fights against a mother-state, *notwithstanding the same nest-odor.* If we do not hold that the mere presence of the Amazon Queen and her being licked by the Dark Gray slaves gives her the "mixed-odor," which is altered into an enemy odor to them in their sisters which have been separated from them, or that, in the second case, the citizens of the daughter-state have attained all at once a different odor, the entire doctrine of "nest-odor" must be set aside absolutely.

The slight applicability of the doctrine of the "nest-odor," upon which the scientists lay so great stress, may very easily be proved, if grown strange workers are placed in an artificial Amazon nest. You need not utilize the Red-bearded or Dark Gray preferred species, but the very warlike Wood Ants. While one or two may be killed, peace is soon established, brought about chiefly by the "stupid" Amazons. They are not so stupid at all, as science would have it, for they understand clearly that an addition to the number of their slaves is useful for them, and they set aside the enemy odor and accept these enemies as their slaves. I have not the least doubt that in all these difficult distinctions *intelligence,* in complicated association of ideas, plays the chief rôle.

This is the case also, when, after months of bloody warfare between two neighboring Ant Peoples, whose citizens encounter one another a dozen times a day, peace is suddenly declared. They do not mix with one another, but live all the more strictly apart, and never dream of licking one another to set up a "peace-mixed-odor." Nevertheless the fighting ceases. Sometimes it is a permanent peace; at others only a prolonged armistice, broken by either side when the occasion arises; but throughout it is a purposeful action *against* the inborn instinct.

Wherever we have memory we have *forgetting*. In every Ant People there are some especially gifted with memory towards other forgetting sisters, just as with humans.

* * *

In the commerce of the Ants of any people with one another there are indications which run far beyond all that is instinctive. Besides the sounds made by chirping, or beating on the ground, which are methods of sounding a general alarm, the Ants have a very highly developed feeler-language by which they convey information of many kinds to one another. If an Ant finds some booty, which is too heavy for her to bring home alone, she goes back to get help from her sisters. She explains to them what she has found, and begs them to follow her, so as to be sure of the booty. If she brings a part of the booty with her, she shows it, and they follow her at once; otherwise she has to persuade some of them to accompany her. They hesitate at first, but finally she wins them over and her comrades go with her.

Sometimes a scout returns with news of a slave-state which she has spied out and insists that they undertake a slave-hunting expedition. Or, one sister tries to persuade another to give her food. Or, workers have found a place, which seems to them well adapted for building a new nest and they argue with their companions to persuade them to found a new city. Or, a warrior runs back to the nest to secure reënforcements for the battle. Or, a Blood Red Ant has found a Fringed Beetle and persuades a couple of other Ants to come and help her bring this joy-dispenser into the nest. Or, "We need leaves for a new mushroom garden." Or, "Help me build a barn for the herd of Leaf-lice." Or, "The children must be taken out for fresh air." Or, or, . . .

These communications are innumerable: many pages might be filled with them to cover the situations which have been observed. The language of the Ants reminds us of the Morse System of telegraphing: short, long, long, short, dot, dash, dot, dash. Gentle and sharp strokes with the feelers, with longer or shorter pauses between, or in quick succession. Tickling the head or the feelers, under, over or in the middle.

* * *

That Ants are teachable is certain. Each one learns through experience, often in a very short time. Forel took a people of Algerian Ants to Switzerland and placed them in his garden. The workers built their nest, as they had been accustomed to do at home, with very large openings, but as they were greatly annoyed in the new land by small Hairy Ants, hitherto unknown to them, which entered the wide openings of the nest between their legs, to steal their brood, they soon learned to close their nest. Mushroom Growers, accustomed for thousands of years to eat nothing but mushrooms, quickly learn to eat honey in an artificial nest, against all their instinct. Some Ants learn easily to crawl on your finger to get a bit of sugar, while others can not be moved to do it. In all of the experiments made to ascertain the intellectual faculties of Ants, it is easily demonstrated that some of them are smarter than others and have better memories than their sisters.

Of course the mind of the Ant works differently than the human. While our memory stores up sight-pictures and tone-pictures, and very seldom odor-pictures or feeling-pictures, the opposite is the case with Ants. Their memory is generally touch-odor pictures, very few sight-pictures, and extremely few tone-pictures.

* * *

Of course Ants sometimes fail to do what seems very simple to us humans. I think it is not true for us to conclude, as so often happens, that they really "consider" it. Besides, what is very easy to us is not easy to Ants, as contrariwise, what the Ants accomplish as a matter of course would seem difficult to us. An experiment with a negative result proves nothing; just as little as we would conclude that a Man was unintelligent because in one instance or another he could not grasp without help something that was childishly simple.

I am of the opinion that Ants possess the power of reflection as well as of reaching a conclusion, not precisely like Men's, but resembling theirs considerably. I could cite dozens of examples from my own observations as well as from those of other investigators, but I desist, as they would require too much space. But here is only one experiment which I made; I select purposely one, which has been cited by others, who have made observations agreeing with mine.

In the camp at Oglethorpe, Georgia, I lived as a prisoner in a tent; my bed standing close to the wall of the tent, which I had raised so as to get fresh air. I had established a feeding-spot for the Ants, a small bowl with granulated sugar in it. I hung the bowl up, possibly three inches from the ground; and so that the way to it would be made easier for the Ants. I had a half a dozen of the Ants in the bowl when I raised it. The six Ants, when they had filled their crops, climbed to the string above, thence to the tent, and down to the ground; thus finding their way back to the nest. When, later, a number of other Ants came looking for their accustomed feeding-place on the ground, they were met by another set of Ants, among which certainly were the first six, and these climbed the tent, and then went down the string to the bowl; all followed this road during the succeeding days.

After a few days the picture changed; while it is true that most of the Ants went up the tent and down the string, and back again, some of them, and soon there were more, allowed themselves to fall from the bowl, and in this way shortened the road. The next morning I saw something quite new. A great number of the Ants were beneath the bowl, busily looking for sugar on the ground, while in the bowl there were only eight Ants. Some of these filled their own crops, while the others were throwing grains of sugar over the top. Apparently when they had climbed over the edge of the bowl to drop to the ground, some grains of sugar had also fallen down with them accidentally; from this the Ants had learned how to throw the sugar over intentionally. Now I changed the bowl for another, which I had made out of tin foil from cigarette boxes, and covered a certain space on the ground, so as to exclude any which fell down accidentally.

The next morning a large number of Ants came. Almost all of them crawled around on the ground under the bowl, although they could find nothing there. Soon some of them decided to go up the tent and down the string into the foil bowl. Then all of them began to fill their crops eagerly. Only after this did they carry some of the grains of sugar to the edge of the bowl and throw them down. This day they did not stop until the last crumb had been taken away. That the dropping over of some of the Ants and the throwing down of grains of sugar implies reflection and arriving at a conclusion seems to be beyond any doubt. Moreover, the Ants in the bowl did not all help alike. While they were making their way over the string I picked them up, one at a time, with pincers, tinted them and put them back. Then I could prove the following. Only two of the Ants took sugar for themselves, and traveled back over the string. One took some sugar, threw more over the edge, and traveled back over the string. Still another took some sugar and then let himself drop over the edge. This also proves that the well known strong "imitativeness" of Ants is not so fixed as the scientists would insist; that personal temperament, individual faculties, play a great part in all of their activities.

* * *

The Ants also show parallels to changes in feeling, which are far above the instinctive, as found in man and the most highly organized animals. A place at which one of their sisters has been torn to pieces is avoided by the Ants. In all of their battles we may observe courage, bravery, anger, real Berserker rage, as well as timidity, fear and cowardice: obvious emotional states. Dead and dying fellow-citizens, those severely wounded or ill, find little sympathy. The Ants seem to feel that there is no help for them, and the best thing is to let them die in peace. But if help is possible, it is certainly offered. This is not done by all the Ants; a number may pass by the wounded Ant, ignoring her and running on without tendering aid, but then an especially compassionate Ant will come along and bring help.

It does not seem to me impossible that the Ant People have certain individuals comparable to our physicians or trained-nurses; that is quite possible. The division of labor has been brought to a high degree of individualization among Ants, both in shape and efficiency. Certainly skilled nurses for the sick may have been specialized before the warriors, hunters and masons. I have observed in one of my artificial nests that two special workers, whom I named Sister Ursula and Sister Cordula, busied themselves especially with any Ants that were wounded or ill.

Those severely wounded were treated as if already dead, picked up and taken out to the place of the dead to die there. Then suddenly another worker appeared and stroked the wounded ones gently as if she wished to show her sympathy for their suffering. Sometimes she let the sufferer lie there and ran away; at others she picked her up and took her back into the nest. I have observed how, after one of the drawn battles which I had brought about, three severely wounded were taken away with the dead. Later a worker came, that very Sister Cordula, and examined all three, stopping only a moment near one of them but remaining a longer time with the other two. Finally she took one of these back into the nest. I could not avoid the impression that Sister Cordula had examined the wounded, giving up all hope as to two of them, but making an effort to save the third.

In these battles we often observe that one worker who has been seized by half a dozen others and is in imminent danger of being killed or taken prisoner, is rescued by her comrades. It is like flying in the face of facts to have some of the experts, who refuse to admit that Ants have the power of reflection, state that such rescues are purely accidental; the "rescuers" did not seek to save her, but were only fighting, the freeing of their friend being merely incidental. No, here we have to do with conscious desire to save, precisely as in other cases observed by me and others, that Ants help to pull out their sisters who have fallen into water, and can not climb a steep incline, and therefore are in danger of drowning.

* * *

As a schoolboy I used to enjoy making all kinds of animals drunk. As a rule all animals are very fond of alcohol, but there are some fine creatures that will have nothing to do with drinking, or touch a crumb that has been soaked in brandy, having been deceived once into a sad experience. Others seem never to be able to get enough. Drunken Chickens, Ducks, Geese present the most comical pictures; a Tortoise, which I managed after great pains and considerable patience to intoxicate, staggered up to every tree in the garden, stood upon his hind legs and tried his best to climb up. A small Mexican Bear, which had learned to drink from the sailors, became a regular drunkard. In San Antonio, Texas, I often took him out with me; he knew every saloon, and pulled hard at his chain, to make me go in with him. Once in, he was quick to get behind the counter; he considered the drops of beer that he could lick from the spigot his right. Very often he pulled away from me in the street, to run back to a saloon; but when he had enough, he lay down to sleep off his "drunk."

That Ants do not refuse intoxicants, we have seen in connection with the Blood Reds; the secretions which they get by licking the golden-haired Fringed Beetles certainly bring about a kind of intoxication. I have made experiments in order to ascertain whether special individuals in the nest of the Blood Reds were inclined towards the Fringed Beetles temperamentally, but I did not find it to be so; it seems that the entire people is prone to this vice. As far as alcohol is concerned, some Ants are fond of it, while it is hated by others. Drunken Ants act very much like my Mexican Bear; they sleep off their "drunk." The treatment of the drunken sisters by the abstemious Ants is very comical. The English investigator, Lubbock, made some experiments, much like mine, almost half a century ago, and he differs only slightly in the details of the picture. His humorous observation is as follows:

He made forty Ants drunk and placed them in a much traveled Ant road. Twenty of them belonged to those using this path, the other twenty were enemies. The sober Ants soon found the slumbering drunkards and picked them up. Near that spot they saw a shallow pool of water. Seventeen of the enemy drunkards were cast into the water and three were taken prisoner into their nest, to be torn to bits there. Sixteen of their drunken sisters were taken home, there to sleep off their intoxication in private, but four of them were thrown into the water. The most comical thing happened to one of these four. A friend took her back to the nest, but at the gate of the city two highly moral workers met them, took away the drunken one, and took her back and threw her into the cold bath.

In my own observations the sober Ants acted a little differently. Usually there was great excitement among them, and they came in crowds to stroke the drunken sisters. They seemed to be very indignant. Usually all the drunks were taken to the nest, but sometimes a couple were left there or tugged to one side, or even cast upon the trash-heap. If I placed a drunken stranger Ant there, it was at once dragged aside. Only twice was I certain that one was taken into the nest; on the contrary, the stranger was usually torn to bits on the spot. I have also seen them thrown into the water, but only in an artificial nest, where the road passed over a small plank across some water; there it appeared to be a mere putting them off the road. On the other hand, when I built a small hut, not far from the place where the drunken Ants were, they ignored it and put neither friend nor foe into it. Moreover, I have proved that the cold bath did not injure the drunken Ants. Of a dozen which I threw into the water, and which lay there as if dead, not one drowned. After a couple of hours all of them crawled out. This casting into the water was more a method of getting them out of the way than of trying to drown them.

* * *

If thoughtlessly I sit down on an Ant-nest and after a while, as if stung by a Tarantula, I jump up, my movement is purely reflex, no real "action." In order to act there must be some exchange between my sense organs, in this case feeling, and the superior so-called psychomotor centers. That Ants perform "actions," not, as some scholars would have it, react only through reflexes, seems to be proved by these stories, since in these processes they obey not pure instincts, but also feelings, impulses, mental promptings, reflections. But there must be germ-design, which operates from the *Amœba primitiva* up through the thought-power of the composer of "Faust," which moves, urges, gives direction to it all. This something is present in all creatures. It is in Man and in the *Infusorium.*

The name by which it is called is not important, no matter how much the philosophers and naturalists quarrel about it. Not one of them can rightly contradict me when I call it "That in you." I am leaving to every one whatever he wants.

I do not believe in purely reflex machines, whether in Men or Worms or Centipedes. The doctrines of Loeb and his pupils, the doctrine of "Tropisms" is, if generalized, certainly basically false. This intuition holds that it can explain by the action of light or action of gravity, by chemical, electric or heat-stimuli in a purely elemental way, without any aid of sense-perceptions, the actions called into being in living creatures, physicochemically.

In the Rockefeller Institute in New York, I studied many fascinating experiments of the great physiologist, J. Loeb, which nevertheless yielded me but one conviction: if the action of the Sea Urchin is to be denominated purely reflex, then the action of Man is quite as reflex; there is not the least difference between the two. That everything alive, and dead, responds to some chemico-physical stimulus by reflexes, is doubtless correct; but besides this response, everything living responds otherwise as well, and this alone distinguishes the living from the dead.

When an Amœba is searching for prey, the animal to be devoured may indeed release the impulse to be incorporated by the Amœba in a purely chemical way. But the way in which it goes hunting, how it lets feet and feelers grow rapidly, how it persists in its movements and attempts at grasping, and alters these, until it has swallowed the prey—*that* is a special response which is assuredly not reflex. *What* is it that furnishes this special response?

Experiments have been made with lifeless matter in order to ascertain the mechanical means by which the Amœba makes its movements. The experiment of a drop of chloroform under water is very beautiful. When a small glass rod covered with shellac is brought close to the drop of chloroform, the rod is drawn in, is *devoured;* but just as soon as the layer of shellac is dissolved, *digested,* the clean rod is pushed out—*vomited*—for glass and chloroform are repulsive. Just in the same way as this *artificial animal,* the chloroform drop, acts, so does the real animal; the Amœba. Yet, with a difference! If you cut out the *nucleus* of the Amœba, while it is still a living animal, it can not do anything, much less than the chloroform drop. Notwithstanding that the remarkable activity of the Amœba, of moving its limbs according to need instantly, and grasping, is extended over all the animal, it can not be utilized save through the nucleus-containing animal. It alone can grow arms and legs, can take in food, can digest, and regenerate itself, and it does so in new ways and kinds, giving forth *special* responses. The Amœba is now much less a *machine* than a man is.

Thus the response emanates from the nucleus, and what is this *nucleus* but the parental bit of the human brain? Here it seems is the seat of the "That" in the Amœba. If now I call the "That" in man "soul," there is no reason to give any other name to it in the Amœba.

I have kept Pigs with the Monists for a long time, and plowed the hard soil with Darwin and Haeckel. I am very thankful that my keen-scented Pigs have dug up some truffles for me, but I have never reach down farther than two feet under the surface. The Neovitalists, the biologists, have not helped me to get any deeper. Not one of them has succeeded in bringing me a finger's breadth nearer to the understanding of the causal mechanism of that eternal puzzle, the *soul.* The fact that by my conscious will at this moment I let my right hand write on the paper is causally utterly inconceivable, humanly incomprehensible. Only when we can build a machine do we understand it fully, and this applies to the *machine* of living creatures as well as to a steam engine.

So long as we can not do this—and we seem to be a long way from it—so long is the connection between psychical and corporeal utterly beyond our grasp, although we use this connection consciously every second. And this inconceivability becomes an inexplicable wonder, when we see that the nonphysical, the psychical, the *great-original,* is the sole determinant. Even through that back-door of "psychophysical parallelism," which sets up beside the known and recognized physical, the biologic-material, a psychical-unknown as compulsorily accompanying or sequential. For all that *accompanies,* all that is *sequential* can be thought of as taken away, and then all that remains as *original* is the mechanical-material; a more perfect bit of nonsense, if we recognize the psychical as ever present.

But the contrary may be true. Two things constitute the world: Space and Time. The atom we now know is made up of electrons; an electron is a thought, a geometrical point, a center of power without extension. In this point there is only power, but no matter; but where there is no matter, there is no space. Just as little as space is there, is time there; it is not really present, but only in so far as we think it. Thus in the beginning there was only something: *that, which we think—only a thought-world exists.*

Then truly the Psyche is the original, and everything else grows from it, from the second legs of the Amœba to Goethe's "Faust" and Beethoven's Ninth Symphony. *"That in you"* let it be!

* * *

A hundred sages have given a hundred names to this "Something." It has been placed in matter itself, or has been considered some principle different from matter, which is the great original cause of all development. What this "Something" is, I know as little as any one else; that it exists, I know very well. It seems to me simplest to call it the soul. A hundred and fifty years ago they wrote long essays asking whether women had souls or not, for and against. There is an entire literature on this subject in our libraries. To-day we admit that women have souls; but there are many hundred million human beings who claim souls for humanity but will not allow them to the most highly organized animals. They have "animal souls" altogether different from the human soul. Different? Certainly; are there two human souls, two human hands or human ears, which are altogether like each other? Nevertheless the soul, that mysterious Something, which is the urge of all life, is the same in the buttercup as in the infusorium; in Man as in the Ant.

* * *

In New York, a few years ago, there was a social game called Transmigration of Souls. Wherever you went it was played. Every one was asked which animal he would like to be, if he was reborn. He had to have a good reason for his choice, yet it is remarkable what stupid answers were given. Nevertheless, I think it is interesting to learn which animals some of the most famous men or women might have chosen for their own transmigration.

Moltke was greatly interested in the transmigration of souls; Bismarck no less. The latter said: "If I had to choose the form in which I would rather live again, I think it would be as an Ant. Just see: this little creature lives under a perfect political organization. All Ants are obliged to labor, to lead a useful life; all are industrious, and perfect subordination prevails, with discipline and order. They are happy because they work."

FINIS

APPENDIX

COMMON AND SCIENTIFIC NAMES OF ANTS

Agriculturists—See Harvester.
Amazon—Polyergus rufescens.
Ashen—Formica cinerea.

Bakers—Aphænogaster barbarus.
Balloon-stomach—See Honey Ants.
Bearded Ants—Pogonomyrmex barbatus, Holcomyrmex, Messor, etc.
Beggar—See Guest Ant, real.
Blood Reds—Formica sanguinea.
Brood-stealer—See Thieving Ant.
Bull-dog Ants—Myrmecia forficata.

Carpenter Ants—Camponotus, Colobopsis, Leptothorax, etc.
Cattle-keepers—Lasius, Cremastogaster, Myrmica, Camponotus, etc.
Coopers—See Honey Ants.
Co-savers—Sympheidole elecebra.

Digger Ants—Bothriomyrmex meridionalis.
Dark Gray—Formica fusca.
Door Ant—Colobopsis.

Fire Ants—Solenopsis geminata.
Fourfold Ants—Tetramorium.

Garden Ants—Lasius.
Gardener Ants—Camponotus femoratus, Azteca olithrix, etc.
Gipsies—See Wandering Ants.
Grain Gatherers—See Harvesters.
Grass Green—Œcophylla smaragdina.
Guest Ants—Formicoxenus nitidulus.
Guest Ants, real—Leptothorax Emersoni.

Hairy Ants—Lasius.
Hanging-stomach —Cremastogaster.
Harvesters — Aphænogaster. Messor, Pheidole, Holcomyrmex, Pogonomyrmex, etc.
Herders—See Cattle-Keepers.
Highwaymen—Dorymyrmex pyramicus.
Honey Ants—Myrmecocystus hortideorum, Mexicanus, Camponotus inflatus, etc.

House Ants—Monomorium destructor, Pharaonis, Pheidole megalocephala, Iridomyrmex humilis, Solenopsis molesta, etc.
Huber Ants—Strongylognathus Huberi.
Humpbacked Ants—Camponotinæ.
Huns—See Wandering Ants.

Jumpers—See Tooth-Fighters.
Jumpers—Odontomachus.

Knotted Ants—Myrmecinæ.

Lapped-armor Ants—Lobopelta.
Leaf-cutters—Atta.
Living Door—See Door Ants.
Long-necked—Dolichoderinæ.

Masons—Lasius niger.
Milkmaids—See Cattle Keepers.
Miner Ants—Lobopelta.
Mushroom Growers—Lasius fulginosus, Atta, Trachymyrmex, etc.

Narrow-breasted — Leptothorax.
Nomads—See Wandering Ants.
Nurses—Cremastogaster inflata, difformis.

Paper Makers—Lasius fuliginosus, umbratus, Dolichoderus, Liometopum microcephalum, etc.
Paper Workers—Cremastogaster Schenki, Azteca, Polyrhachis, etc.
Pharaoh Ants—Monomorium Pharaonis.
Plasterers — Pogonomyrmex occidentalis.
Prairie Ants—See Plasterers.

Red—See Wood Ants.
Red Bearded—Formica rufibarbis.
Regicide—See Miners.
Robber Barons—See Highwaymen.
Robber Guest—Harpagoxenus (Tomognathus sublævis).
Roofers—Pogonomyrmex occidentalis.

Saving Ants—Pheidole ceres.
Scaled Ants—See Hump Backed Ants.
Scamp Ants—Tapinoma erraticum.
Sickle Ants, Yellowish-red—Strongylognathus testacæus.
Slave-holders—Formica sanguinea, Polyergus rufescens, Strongylonathus, etc.
Soldier-devourers — Pheidole militicida.
Solomon Ants—Monomorium Salomonis.
Sooty-haired—Lasius fuliginosus.
Sowers—Pogonomyrmex molefaciens.
Spinners—Œcophylla smaragdina, Camponotus senex, etc.

Stinging Ants—Ponerinæ.

Tapestry Hangers—Lasius fuliginosus.

Tepegua—Eciton prædator, hamatum, etc.

Termite Hunters—Leptogenys, Lobopelta, Odontomachus, etc.

Thieving Ants—Solenopsis fugax.

Thieving Ants, real—Monomorium decamerum.

Tooth Fighters—Odontomachus.

Turf Ants—Tetramorium cespitum.

Vegetable Growers—See Mushroom growers.

Wandering Ants—Dorylinæ.

Wheeler Ants—Wheeleriella Santschii.

Wicked Ants—See Stinging Ants.

Wood Ants, Red—Formica rufa.

Wood-cutters—See Carpenter Ants.

Wood-meadow Ants—Formica pratensis.

Workerless—Anergates atratulus.